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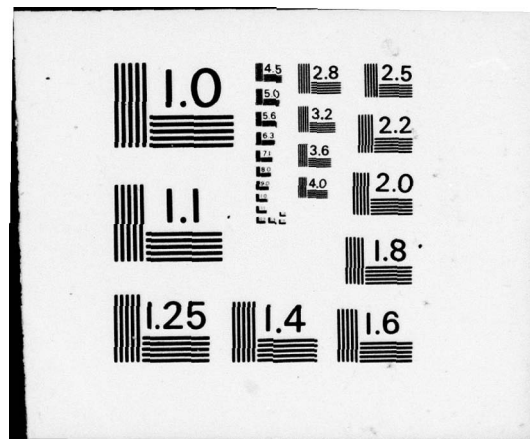
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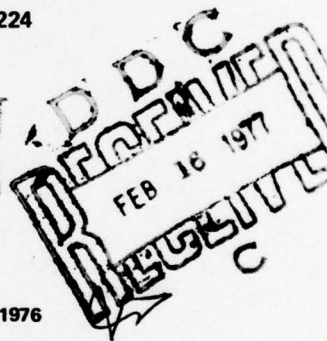
**INVESTIGATION OF DIAGNOSTIC, ERROR DETECTOR,  
AND SELF-TAUGHT INSTRUCTIONAL STRATEGIES FOR  
FLIGHT SIMULATOR PROGRAMS**

By

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This final report was submitted by Flying Training Division, Air Force Human Resources Laboratory, Williams Air Force Base, Arizona 85224, under project 1123, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235.

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This technical report has been reviewed and is approved.

J.D. BOREN, Colonel, USAF  
Chief, Flying Training Division

Approved for publication.

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| self-taught instruction   | simulator             | computer data collection   |
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| <p>This study investigated the use of three instructional strategies in the training of basic instrument flight maneuvers in a T-40 simulator under standard conditions and two levels of increased task loading. The three strategies investigated were: (a) diagnostic; (b) error detector; and (c) self-taught. Diagnostic instructors used immediate feedback through error analysis, the error detector instructor used limited feedback, and the self-taught group was instructed without the aid of any feedback from the instructor pilot. The three levels of loading were: (a) no task loading; (b) a change in the center of gravity from normal to full forward; and (c) a change in air turbulence from zero to maximum. Twenty-seven Air Force officers awaiting entry into undergraduate pilot training were randomly assigned to one of the three instructional strategy groups. Each student flew four 50-minute sorties. They</p> |                       |  |

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were instructed on the following maneuvers: straight and level flight, left turns, right turns, constant airspeed climbs and descents. The fourth sortie was the criterion sortie composed of continuous testing on all five maneuvers, first under normal conditions ~~and then under the two different task load conditions.~~ The results indicate that there were no significant differences between the three instructional strategies; i.e., the students of any one strategy performed equally as well as the students of the other two strategies. The results indicated that there were significant differences among task load conditions. A general decrement in performance was noted when the students flew the maneuvers with the center of gravity change and an even greater decrement when they flew with maximum turbulence.



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## PREFACE

This study was conducted in support of project 1123, Flying Training Development, Dr. Edward E. Eddowes, Project Scientist; task 1123-02, Instructional Innovations in USAF Flying Training, Mr. Gary B. Reid, Task Scientist; work unit 1123-02-20, Investigation of Alternative Instructional Strategies for Basic Instrument Flight Training in the T-40, Dr. Dolores M. Tyler, Principal Investigator, Captain Robert W. McFadden, Dr. Edward E. Eddowes and Major Robert R. Fuller, Associate Investigators. This report covers research conducted between April 1975 and May 1976.

This study was conducted by the Flying Training Division of the Air Force Human Resources Laboratory (AFSC) in coordination with Headquarters Air Training Command (Hq ATC), Randolph AFB, TX, and the 82d Flying Training Wing (82 FTW), and the 96th Flying Training Squadron (96 FTS) at Williams AFB, AZ. Great appreciation is expressed for the active support given and the genuine interest shown by the commanders and personnel of these organizations.

Special recognition is given to LtCol Gerald Floyd, Commander of the Research Support Division (DOR) of the 82FTW, Major Brian K. Waters and Ms. Marjorie V. Scotten, without whose dedicated support this project could not have been successfully completed.

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# INVESTIGATION OF DIAGNOSTIC, ERROR DETECTOR, AND SELF-TAUGHT INSTRUCTIONAL STRATEGIES FOR FLIGHT SIMULATOR PROGRAMS

## I. INTRODUCTION

The advances in computer technology and fidelity of simulators have produced impressive utilization concepts for flight simulators. This, coupled with the technological advances in complex aircraft systems has precipitated the need for a change in the instructor pilot's role from an equipment demonstrator and operator to that of a training strategist, and has greatly increased the demands made upon pilot training programs. Associated increases in operating costs in an increasingly austere training operations environment further necessitate the search for more effective training methods and procedures.

This research effort examined three types of instructional strategies which describe conventional techniques of flight instruction presently in undergraduate pilot training (UPT). Research (Eddowes & King, 1975) has indicated that the front line of flight training management, the instructor pilot (IP), represents a significant area of concern in UPT programs. In a study conducted at the Air Force Human Resources Laboratory (AFHRL), Flying Training Division at Williams Air Force Base, Arizona, it was found that the student pilots believed some of their IPs were not as effective instructors as they could be. Since the IP is one of the most important elements of the UPT program, he should be operating at optimum efficiency. This desired optimization requires a definition of how to maximize the effectiveness of a flight training strategy thereby providing a productive and applicable means of training instructor pilots and student pilots.

The process of training instructor pilots begins at pilot instructor training (PIT) where the IP trainees learn the methods of teaching the initial procedures of flying to their students and progresses through the continuing training of students to completion of UPT. The techniques of how to best accomplish the procedures are left up to the individual IPs. These techniques may in fact be uneven and may produce unnecessary discrepancies between student pilot graduates.

The objective of this study was to determine if there were significant differences among the instructional strategies evaluated, in terms of the learning and performance of students in the acquisition of basic instrument flying skills. These strategies are described briefly in the following paragraphs.

### Instructional Strategies

*Diagnostic Technique.* The diagnostic instructor pilot used a method which provided verbal flight information (extrinsic and immediate feedback) through error analysis. Error analysis is the detection of deviations from the desired parameters and required procedures with timely instructions on correction techniques. The diagnostic feature of this method was the instructor's detection of mistakes coupled with immediate follow-up instruction on corrective actions required. Additionally, the term diagnostic as used here connotes the correction of deviations as they begin to appear. Performance information was continuously fed back to the student through aircraft instruments (intrinsic feedback). With these two types of feedback, the student could make timely adjustments to achieve or maintain desired performance. The error analysis was most apparent during practice segments.

*Error Detector.* The error detector instructor pilot used a method which provided verbal flight information similar to the diagnostic approach. The major difference here was that the error detector IP stopped with the detection and acknowledgement of errors. He did not analyze the errors with a breakdown description of why each occurred or how to make the appropriate corrections. Performance information was given from the instrument readings. However, the student had only this feedback and minimal error detection from the IP with which to decide upon adjustments to achieve or maintain desired performance. The IP did not answer "why" questions from the student. The student had to learn to optimize his aircraft control skills during maneuvers on his own. Feedback was immediate but limited. This strategy was used to produce an error-conscious student who would look for, find, and correct his errors quickly and accurately.

*Self-Taught.* The self-taught Instructor Pilot provided one-time only instruction of the maneuvers. Similar to the other two strategies, the IP instructed the procedures of each maneuver. However, before the practice segments, the IP exited the trainer. There was no verbal feedback at all from the IP. The performance information, of course, remained through the use of the instrument readings. Following the practice segments, the IP re-entered the trainer and resumed an instructional segment or administered an evaluation. The learning was largely trial and error.

## II. METHOD AND PROCEDURES

### Subjects

Twenty-seven Air Force officers, awaiting entry into UPT at Williams Air Force Base, Arizona, served as subjects in this study. The subjects were selected randomly from a group which met the following restrictions: (a) no subject could have more than 60 hours of prior flying time in light, civilian aircraft, (b) no subject could have participated as an aircrew member in the general category of navigator, and (c) all subjects had to be members of the USAF on active duty (i.e., no foreign nationals). The last restriction was required in order to avoid language problems. After selection, according to stated constraints, all subjects were found to be recent Air Force Academy graduates in the grade of second lieutenant with comparable flying experience.

### Instructor Pilots (IP)

Three experienced instructor pilots were selected to conduct the simulator training from the 82 Flying Training Wing, Flying Training Research Division (DOR), located at Williams AFB, AZ. These IPs were trained for the study and supervised by the AFHRL project research instructor pilot, Captain Robert W. McFadden.

### Instrument Flight Trainer, Type A/F37A-T40

The instrument flight trainer consists of a cockpit shell containing a facsimile of the pilot and copilot stations of a twin-engine utility jet aircraft. The cockpit is mounted on a two-degree-of-freedom, hydraulically operated motion system. The instructor station is located adjacent to the cockpit on a desk.

### General Procedures

The DOR IPs were extensively trained in the use of each instructional strategy, the use of the training syllabus (Appendix E), computer data collection control, manual in-cockpit data collection and characteristics of the T-40 trainer. On the first of three training days, the IPs were shown all the pretraining materials used by the subjects including the pretraining guide (Appendix B), the video tape, and criterion measurement written exam (Appendix D). In this manner, each IP became familiar with the amount of information and the level of difficulty to which each subject was exposed. In addition, each IP reviewed the syllabus and received training on how to use the standardized directions for each of the strategies.

On the second day, each IP was instructed in and practiced flying the T-40 trainer. Due to the limited time available for manually resetting the trainer during subject training and evaluation, each IP practiced until proficient in reset procedures. In addition, each IP learned to use the computer data collection switch panel, the load factor control panel, and the console control panel located outside of the T-40 trainer.

On the last day, each IP practiced instructing using the syllabus directions for each strategy condition. The subjects for the practice sessions were non-pilot employees of AFHRL. At the end of the practice instructional sortie, each IP administered the flying evaluation to the subject to practice recording on the IP evaluation data collection sheets (Appendix F).

The subjects were randomly assigned to three groups of nine each. Each ran for six days. The first day included a 30-minute orientation briefing and three and one-half hours for studying the take-home pretraining guide in a controlled environment. Subjects were instructed to take the pretraining guide home for study over the weekend. The pretraining guide contained an overview of instrument flight procedures, a description of the T-40 trainer, discussions of attitude instrument flying, each instrument to be used, each

maneuver to be taught, crosscheck, and trim. Each subject was required to read the pretraining guide at least once including completion of the self-test at the end of the booklet.

The second training day began on the following Monday. This day included viewing the 30-minute pretraining videotape and taking a 30-question criterion exam as a group. The videotape presented the same material as was in the pretraining guide to review and amplify each topic. It further provided a moving display of the T-40 trainer instruments, demonstrating each of the five maneuvers and proper instrument crosschecks.

The criterion exam was administered to estimate how well each subject met the pretraining objectives. A criterion level score of 85% or better, the standard used by Air Training Command in UPT academic programs, was required to "pass" the criterion exam. Each subject who achieved less than 85% was retrained immediately by viewing the videotape again and retaking the exam.

After each subject completed the pretraining, the corrected exam was discussed and subjects were randomly assigned to an instructional strategy and scheduled into a training period. Sortie 1 began immediately after the pretraining session with all nine subjects completing a given sortie on the same day. Sorties 2, 3, and 4 were conducted during the third, fourth, and fifth days.

On the sixth and final day, each subject filled out a critique questionnaire and was briefed on those aspects of the study not covered during training.

#### Task Procedures

Sortie 1 included T-40 trainer cockpit familiarization, a five-minute skill test on straight and level flight, instruction of and practice in straight and level flight, left turns to a heading, right turns to a heading, and an evaluation. The schedule of sorties is shown in Table 1. All sorties were started from a standard set of airborne initial conditions with the trainer on problem freeze (Appendix E).

Table 1. Task Procedures for the Three Instructional Strategies for the Four Flight Sorties

|          | I<br>Diagnostic  | II<br>Error Detector   | III<br>Self-Taught  |
|----------|--|--|---|
| Sortie 1 | 30 Min Preflt Brf - Outside<br>5 Min Skill Test (ST&L)<br>10 Min Instr (A-C)<br>20 Min Prac (A-C)<br>15 Min Eval (A-C) | 30 Min Preflt Brf - Outside<br>5 Min Skill Test (ST&L)<br>10 Min Instr (A-C)<br>20 Min Prac (A-C)<br>15 Min Eval (A-C) | 30 Min Preflt Brf - Outside<br>5 Min Skill Test (ST&L) IP In<br>10 Min Instr (A-C) IP In<br>20 Min Prac (A-C) IP Out<br>15 Min Eval (A-C) IP In |
| Sortie 2 | 5 Min Prac (A-C)<br>10 Min Instr (D, E)<br>15 Min Prac (A-E)<br>20 Min Eval (A-E)                                      | 5 Min Prac (A-C)<br>10 Min Instr (D, E)<br>15 Min Prac (A-E)<br>20 Min Eval (A-E)                                      | 5 Min Prac (A-C) IP Out<br>10 Min Instr (D, E) IP In<br>15 Min Prac (A-E) IP Out<br>20 Min Eval (A-E) IP Out                                    |
| Sortie 3 | 5 Min Instr (A-E)<br>25 Min Prac (A-E)<br>20 Min Eval (A-E)  | 5 Min Instr (A-E)<br>25 Min Prac (A-E)<br>20 Min Eval (A-E)  | 5 Min Instr (A-E) IP In<br>25 Min Prac (A-E) IP Out<br>20 Min Eval (A-E) IP In  |
| Sortie 4 | 50 Min Criterion Ride (A-E)  | 50 Min Criterion Ride (A-E)  | 50 Min Criterion Ride (A-E)   |

After the brief familiarization, the subject was given the skill level measurement test on straight and level flight. He was told the altitude, heading, and airspeed to maintain. The trainer was taken off problem freeze and the subject flew for five minutes. The only information given to him about the requirements for straight and level flight came from the pretraining guide and the videotape. The skill test was performed to measure basic understanding of straight and level flight from the pretraining material and to record his entry-level basic flying skills for verifying group equivalence in entry behaviors.

After the skill test, the IP formally introduced and instructed straight and level flight, 30° bank left turns to a heading, and 30° bank right turns to a heading (maneuvers A, B, and C, respectively). This instruction lasted for 10 minutes. The subject was then given 20 minutes to practice these three maneuvers with the remaining 15 minutes used for an evaluation of the maneuvers. The evaluation consisted of four minutes of straight and level flight, two left turns to a heading and two right turns to a heading. During the evaluation, data recording was made by the automated data acquisition and control system (ADACS) computer, and the IP recorded his subjective assessment of the student's performance on an evaluation data collection sheet.

During Sortie 2, the first five minutes were used for practice on maneuvers A, B, and C. Following this review, the IP introduced and instructed constant airspeed climbs and descents (maneuvers D and E, respectively) for 10 minutes. The next 15 minutes were used for practice on all five maneuvers. The remaining 20 minutes were used for an evaluation of all maneuvers. The evaluation consisted of straight and level flight for four minutes, two left turns to a heading, two right turns to a heading, one constant airspeed climb and one constant airspeed descent. Data was collected in the same manner as Sortie 1.

Sortie 3 was conducted much the same as Sortie 2 except that the first five minutes were used for instructional review and the next 25 minutes were used for practice on all maneuvers. The 20-minute evaluation was identical to Sortie 2.

Sortie 4 was the criterion sortie composed of continuous testing on all maneuvers, first under normal conditions identical to conditions used on the first three sorties, and then under two different task load conditions called load factor one and load factor two. Load factor one was a change in the center of gravity (CG) from normal at 25% to maximum at 35%. This moved the CG forward enough to force the trainer into a dive. This required a great deal of extra back pressure on the yoke to hold level flight, approximately two degrees of extra back elevator trim to relieve the pressure, and approximately 5% increase in power to hold the same airspeed.

Load factor two was a change in rough air from zero, or no turbulence, to maximum, the most active mode of turbulence. The rough air at maximum caused large excursions in altitude, airspeed, pitch, and bank as if flying in severe turbulence. This required rapid crosscheck attention to all instruments and aggressive inputs to the control yoke to fly the maneuvers accurately.

The testing of Sortie 4 was divided into three segments: (a) maneuvers performed under normal conditions of no task loading for 20 minutes (identical to the evaluations on Sorties 2 and 3); (b) maneuvers performed under load factor one for 15 minutes (four minutes of straight and level flight and one repetition of each of the other four); and (c) maneuvers performed under load factor two for the remaining 15 minutes (again, four minutes of straight and level and one repetition of the other four maneuvers).

The load factors were controlled by the IP in the cockpit. At the beginning of the second segment, he set load factor one to maximum and directed the subject to perform each maneuver. When all five maneuvers were completed and the data were collected, the IP set load factor one to normal and load factor two to maximum and the subject repeated the maneuvers.

#### **Data Collection**

Data collection was accomplished by the ADACS, a special-purpose system based on a Systems Engineering Laboratory (SEL) 72 mini-computer. The various trainer parameters were fed into an analog-to-digital (A/D) converter which was sampled four times per second by the computer. The computer software converted the digital values from the A/D converter into feet and knots, and accumulated running totals of each parameter value, the sum of the squares of each parameter value, and the number of observations.

The maneuver being flown was indicated by a five-position switch located in the T-40 trainer cockpit. Data collection was started and stopped by a two-position switch in the cockpit. While the switch was in the START position the computer continually scanned all the parameters and accumulated the required statistics. When it was returned to the STOP position the data accumulated were recorded on magnetic tape.

### Data Analysis

The primary goal of the investigation was to evaluate the three alternative instructional strategies for application in flight simulator training programs and to optimize instructor pilot techniques for use in instrument flight simulators. Objective and subjective measures of student pilot performance under conditions of normal flight, changes in center of gravity and rough air were computed. For all statistical tests performed on the data presented, the criterion for rejecting the null-hypotheses was  $p < .05$ . Student performances for each maneuver were analyzed under two conditions of task load, a change in the center of gravity of the T-40 simulator, and maximum rough air. Student performances for each maneuver were normalized across measures of altitude, airspeed, and heading and summed to obtain an overall individual score for the analyses of variance. The analyses were performed using five separate split plot factorial analyses of variance (SPF  $p \cdot q$ ) found in Kirk (1968).

Data generated by the skill level measurement task was analyzed by the  $t'$  statistic (Winer, 1962) to compare differences in group performances at initial entry.

Correlational comparisons of the objective performance measures and the subjective performance measures were conducted using the Spearman rank-order correlation coefficient (Senter, 1969).

### III. RESULTS

The comparison of group differences on the skill level measurement task was analyzed by the  $t'$  statistic test (Winer, 1962). No significant differences in mean group performance were found on any of the raw score measures of altitude, airspeed, or heading root mean square deviations as given in Table 2. The reader is reminded that these scores are deviations from ideal performance and thus lower scores reflect "better" performance.

Table 2. Differences in Mean Group Raw Score Performance on the Skill Level Measurement Task

| Strategies     | Altitude | Airspeed | Heading |
|----------------|----------|----------|---------|
| Diagnostic     | 272.133  | 11.211   | 16.366  |
| Error Detector | 314.933  | 12.077   | 14.255  |
| Self-Taught    | 289.377  | 14.200   | 14.044  |

These scores were then normalized on their separate distributions and produced an individual subject's score as the linear sum of his three Z scores. The results are shown in Table 3.

Table 3. Comparison of Group Differences on the Skill Level Measurement Task

| Strategies     | Means | Standard Deviation | Variance |
|----------------|-------|--------------------|----------|
| Diagnostic     | .268  | 2.612              | 6.822    |
| Error Detector | .096  | 2.301              | 5.294    |
| Self-Taught    | .271  | 2.237              | 5.004    |

A  $t'$  statistical comparison (Winer, 1962) of the three groups' total performance score yielded no significant differences in either means ( $t'$ ) or variances between groups. This result validated the random assignment to groups, thus permitting differences in group performances on sorties 1 through 4 to be attributed to conditions or treatments rather than to entering subject abilities.

Spearman rank-order correlations (Senter, 1969) were computed in order to relate the objectively derived measures of performance (ADACS measures) with the subjectively derived measures of performance as rated by the instructor pilots. All correlations were found to be significant beyond the .01 level as presented in Table 4. These significant correlations indicate that substantial relationships exist. This outcome is interpreted as indicating that the automated measures and the IP ratings relate to the same basic behavioral phenomena, in this case, the pilot abilities of the subject.

Table 4. Correlations of Objective Measures with Subjective Instructor Pilot Ratings

| Measure      | Straight and Level | Left Turn | Right Turn | Constant Climbs | Airspeed Descents |
|--------------|--------------------|-----------|------------|-----------------|-------------------|
| RMS Airspeed | .7834*             | .8450*    | .7792*     | .8012*          | .6689*            |
| RMS Heading  | .5799*             | +         | +          | .6078*          | .5421*            |
| RMS Altitude | .5490*             | .6087*    | .7508*     | +               | +                 |

The data were analyzed by five separate split-factorial analyses of variance (Kirk, 1968). Each separate analysis—one for each of the five maneuvers (straight and level, left turns, right turns, constant airspeed climbs, and constant airspeed descents)—had one between measure (strategies) and one repeated measure (task load). There were three levels of strategies (diagnostic, error detector and self-taught) and three levels of task load (normal, center of gravity change, and maximum turbulence). Each separate analysis will be described in the following paragraphs.

#### Maneuvers

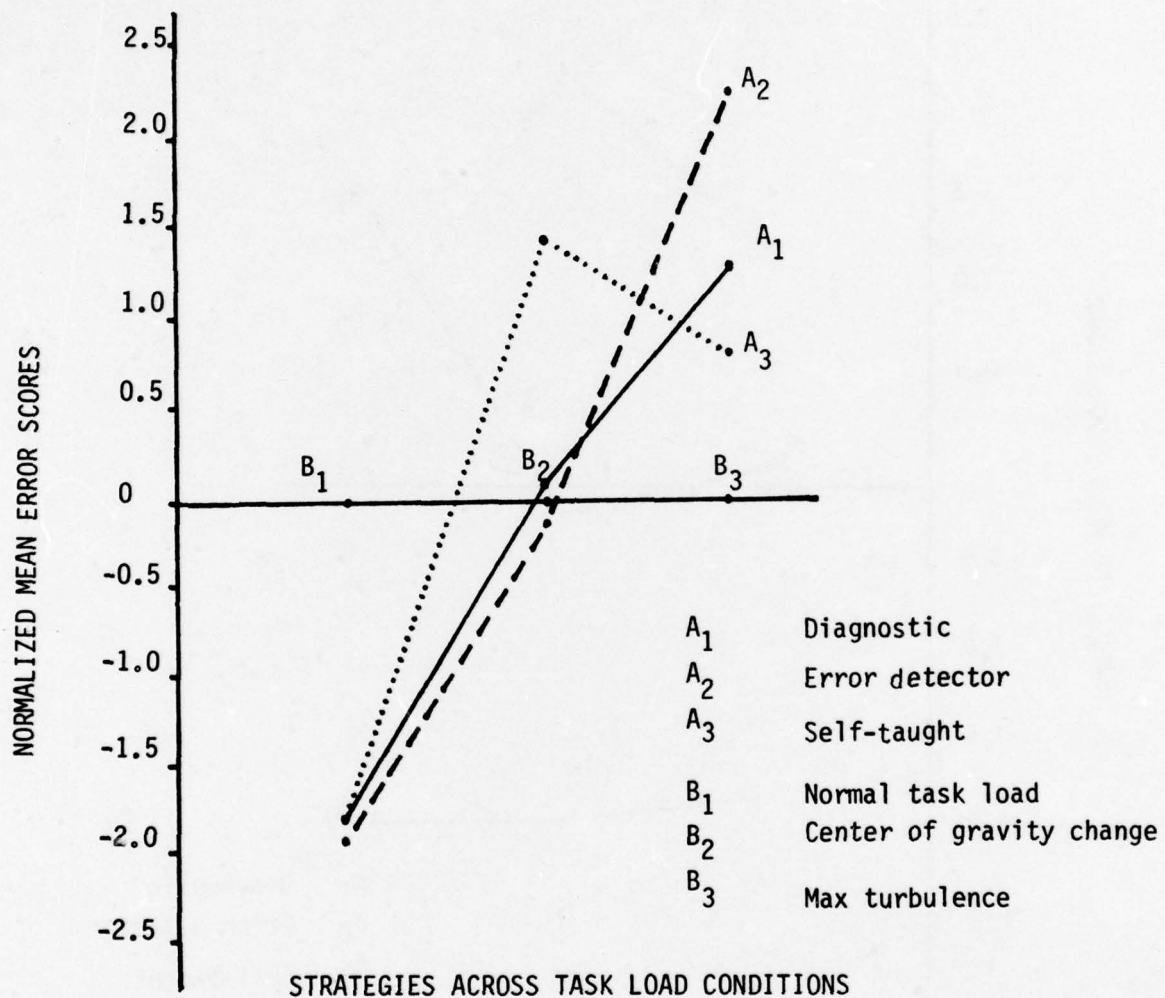
*Straight and Level.* As presented in Table 5, significant main effects were obtained for Task Load (B) [ $F(2,48)=32.761$ ,  $p<.01$ ], but not for Strategies (A) [ $F(2,48)=.107$ ]. The Task Load by Strategy interaction (C) also was not significant [ $F(4,48)=2.255$ ]. A Tukey's HSD test for pairwise comparisons (Kirk, 1968) indicated all differences to be significant. Differences between the first and second and the first and third task load conditions were significant beyond the .01 level while the difference between the second and third task load conditions was significant beyond the .05 level.

The normalized mean amount of error for the three task load conditions across each of the three instructional strategies is presented for straight and level flight in Figure 1. A consistent pattern emerges and continues across each of the following maneuvers. With few exceptions, the scores for Task Load 1 are closer to (in the negative direction) the desired parameters (15,000 feet, 250 knots and 360° heading), center around the mean deviation scores from the desired parameters on Task Load 2, and exceed (in the positive direction) the desired parameters on Task Load 3. An exception in Figure 1 shows Group A<sub>3</sub>'s score on Task Load 2 exceeding the mean score and approaching the mean score on Task Load 3.

Figure 2 presents the normalized mean amount of error for the three instructional strategies across each of the task load conditions for straight and level flight.

*Left Turns.* As presented in Table 5, significant main effects were obtained only for Task Load [ $F(2,48)=26.380$ ,  $p<.01$ ]. A Tukey's HSD test for pairwise comparisons (Kirk, 1968) indicated all differences to be significant. The normalized mean amount of error for the three task load conditions across each of the three instructional strategies is presented for left turns in Figure 3. Figure 4 presents the normalized mean amount of error for the three instructional strategies across each of the task load conditions.

*Right Turns.* As presented in Table 5, significant main effects were obtained only for Task Load [ $F(2,48)=31.531$ ,  $p<.01$ ]. A Tukey's HSD test for pairwise comparisons (Kirk, 1968) indicated all differences to be significant. The normalized mean amount of error for the three task load conditions across



*Figure 1. Normalized mean error scores as a function of instructional strategies across task load conditions for straight and level flight.*

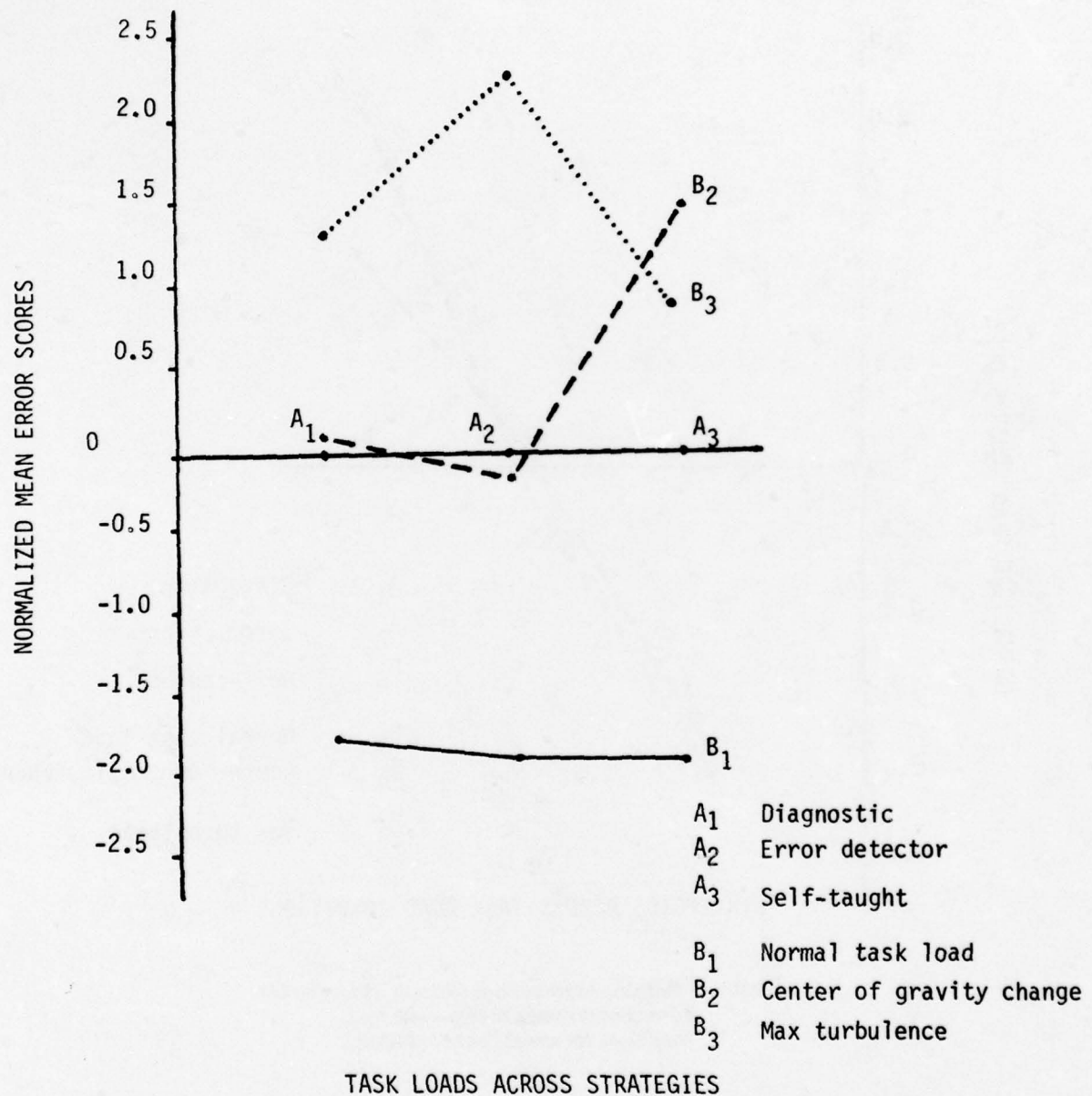


Figure 2. Normalized mean error scores as a function of task load conditions across instructional strategies for straight and level flight.

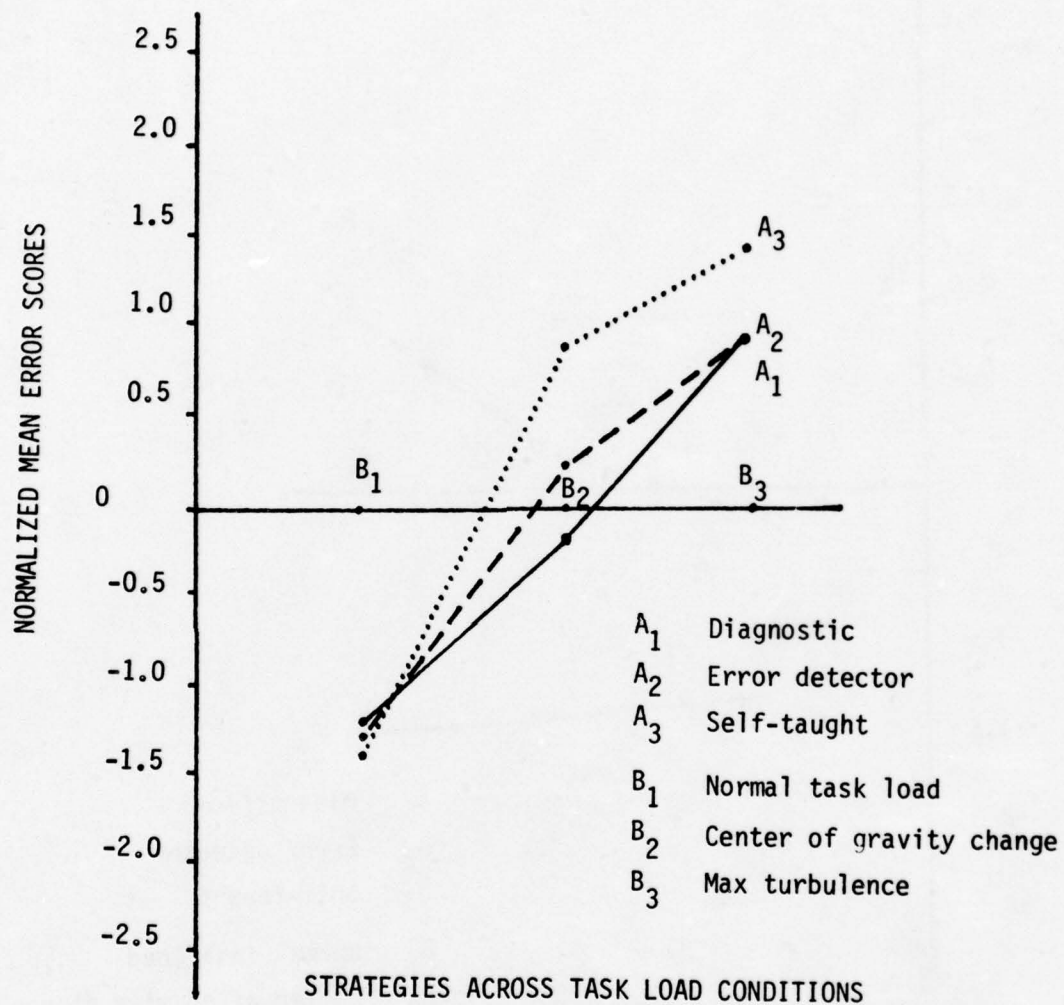


Figure 3. Normalized mean error scores as a function of instructional strategies across task load conditions for left turns.

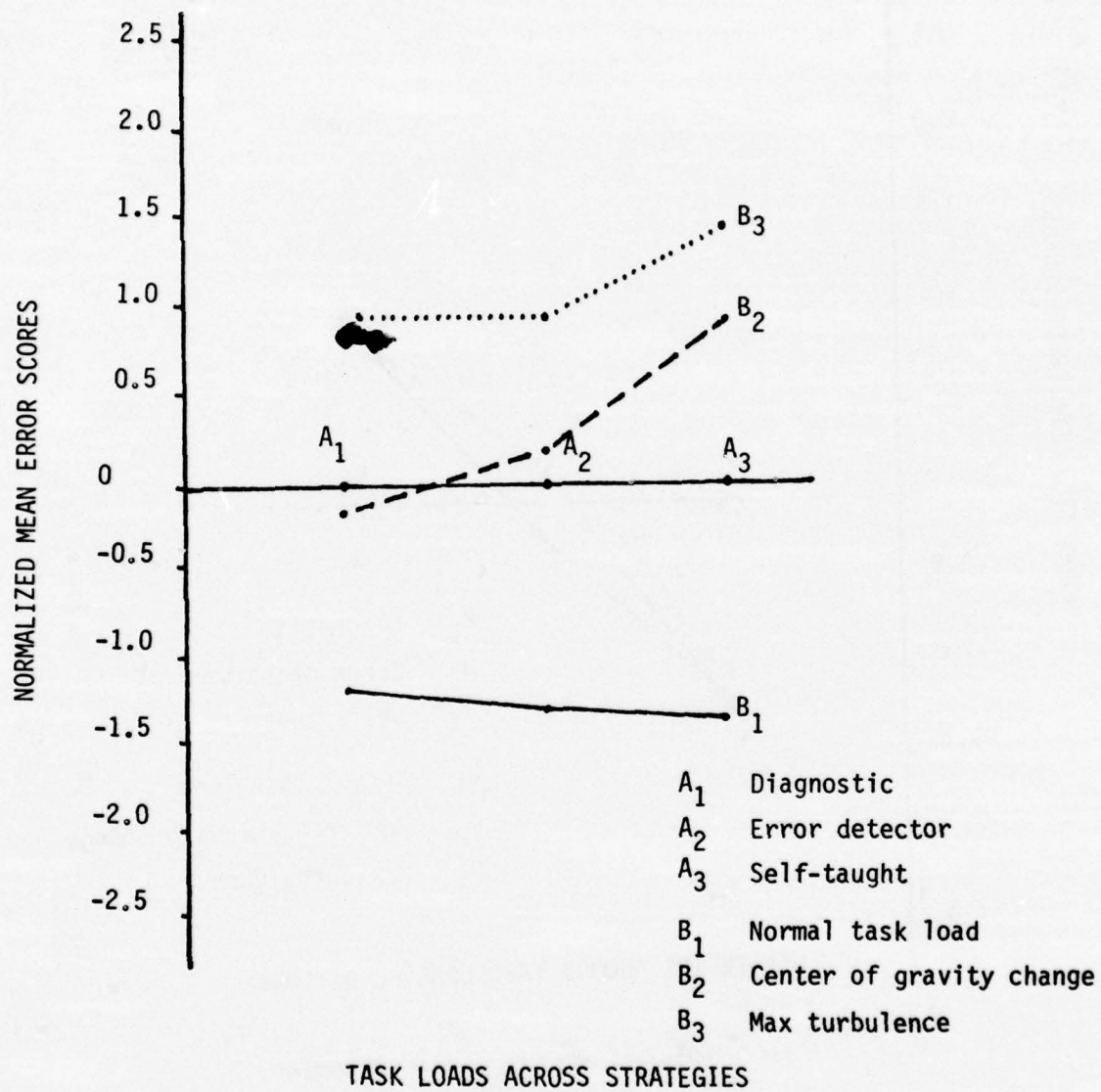


Figure 4. Normalized mean error scores as a function of task load conditions across instructional strategies for left turns.

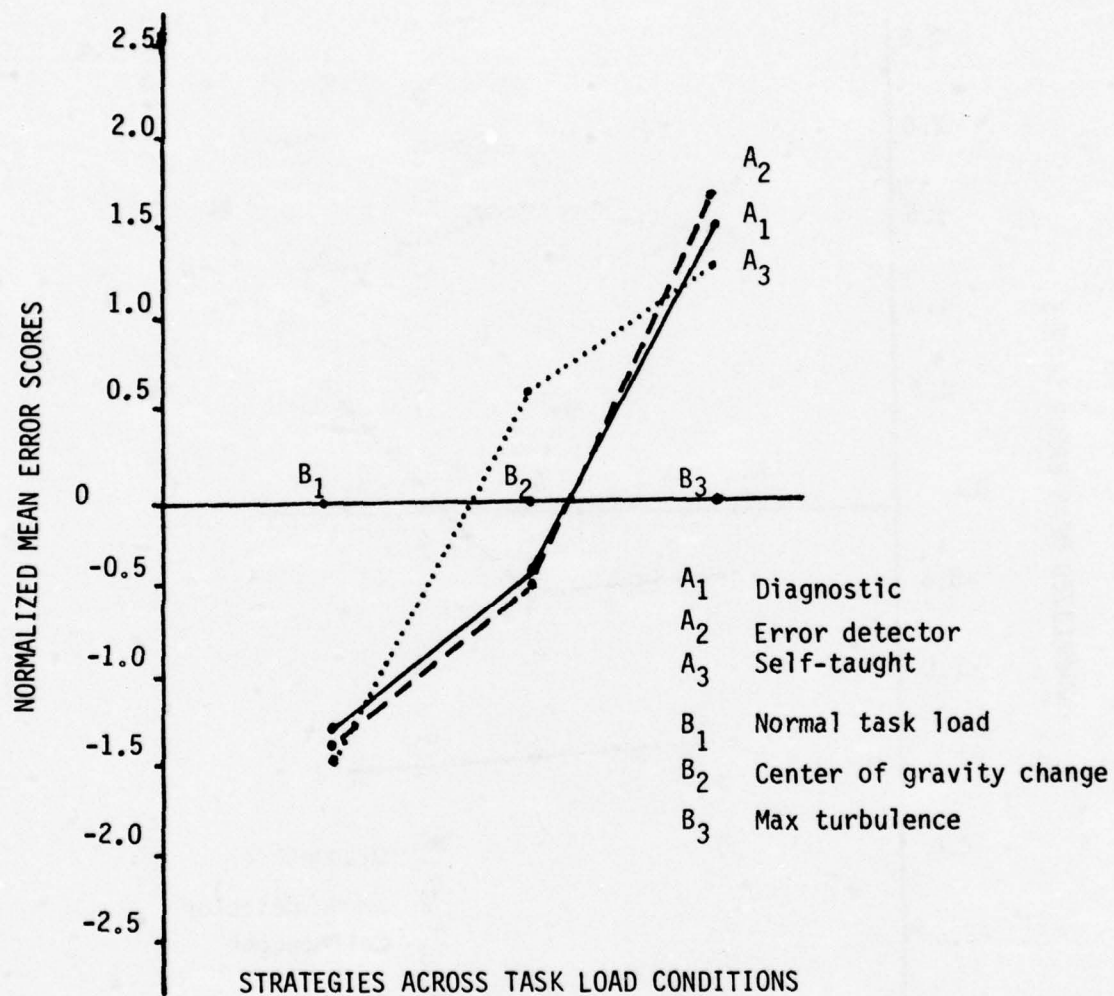


Figure 5. Normalized mean error scores as a function of instructional strategies across task load conditions for right turns.

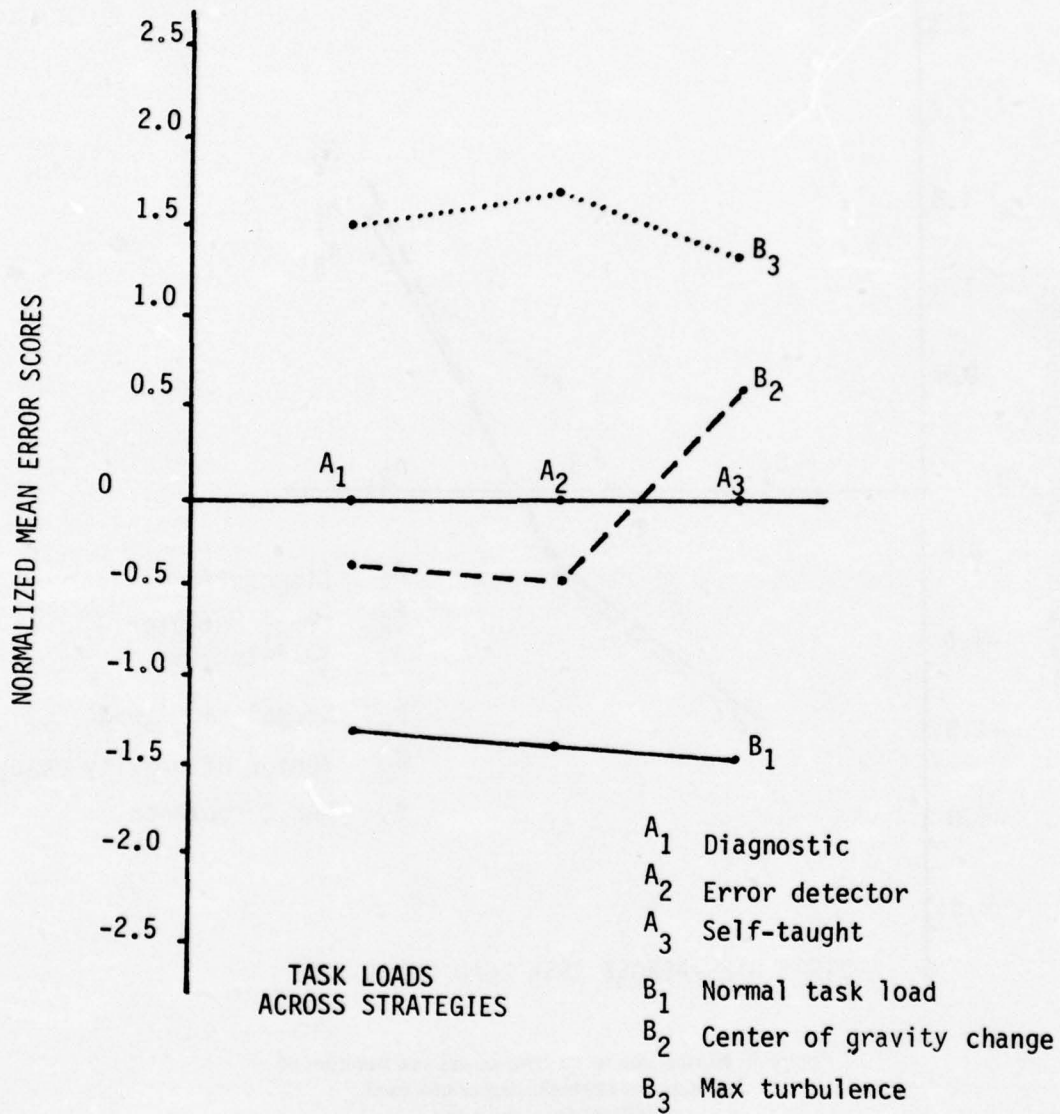


Figure 6. Normalized mean error scores as a function of task load conditions across instructional strategies for right turns.

Table 5. Summary of Analysis of Variance for the Five Maneuvers

| Measure                    | F Test Values |         |       |
|----------------------------|---------------|---------|-------|
|                            | A             | B       | C     |
| Straight and Level         | .107          | 32.761* | 2.255 |
| Left Turns to a Heading    | .694          | 26.380* | .680  |
| Right Turns to a Heading   | .168          | 31.531* | 1.037 |
| Constant Airspeed Climbs   | .931          | 17.029* | .640  |
| Constant Airspeed Descents | 1.392         | 12.094* | 1.602 |

\* $p < .01$ .

each of the three instructional strategies is presented for right turns in Figure 5. Figure 6 presents the normalized mean amount of error for the three instructional strategies across each of the task load conditions.

*Constant Airspeed Climbs.* As presented in Table 5, significant main effects were obtained only for Task Load [ $F(2,48)=17.029$ ,  $p < .01$ ]. A Tukey's HSD test for pairwise comparisons (Kirk, 1968) indicated that two of the three differences were significant. Differences between the first and third and the second and third task load conditions were significant beyond the .01 level. The difference between the first and second task load conditions was not significant.

The normalized mean amount of error for the three task load conditions across each of the three instructional strategies is presented for constant airspeed climbs in Figure 7.

Figure 8 presents the normalized mean amount of error for the three instructional strategies across each of the task load conditions.

*Constant Airspeed Descents.* As presented in Table 5, significant main effects were obtained only for Task Load [ $F(2,48)=12.094$ ,  $p < .01$ ]. A Tukey's HSD test for pairwise comparisons (Kirk, 1968) indicated that two of the three differences were significant. The difference between the first and third task load conditions was significant beyond the .01 level while the difference between the second and third task load conditions was significant beyond the .05 level. The difference between the first and second task load conditions was not significant.

The normalized mean amount of error for the three task load conditions across each of the three instructional strategies is presented for constant airspeed descents in Figure 9. An exception in Figure 9 shows Group A<sub>1</sub>'s score on Task Load 1 exceeding (scoring closer to the mean) the score on Task Load 2.

Figure 10 presents the normalized mean amount of error for the three instructional strategies across each of the task load conditions. As in Figure 2, the Task Load 1 scores are closer to the desired parameters, Task Load 2 scores approach the mean, and Task Load 3 scores exceed the desired parameters. The exception is the Task Load 1 score on Group A<sub>1</sub> which exceeds the desired parameters more than did the Task Load 2 score on the same group.

#### IV. DISCUSSION

The primary considerations of this investigation were the evaluation of three instrument training techniques for use in instrument flight simulators and for the promotion of investigations using the advanced training features available on state-of-the-art flight simulators. A discussion of the results and considerations regarding future research are presented in terms of these considerations.

The results of the alternative instructional strategies study indicate that there were no significant differences between the three strategies applied to the instruction of basic instrument flight maneuvers in a flight simulator. Simply stated, the subjects of the diagnostic strategy gained no more in a learning process than the subjects of the error detector or self-taught strategies.

These results are not consistent with other studies of motor skill learning which have found learning facilitated when the learner was promptly informed of the results of each practice effort so that necessary corrections or adjustments could be made in subsequent performance (Fitts & Posner, 1967; Smode, 1958,

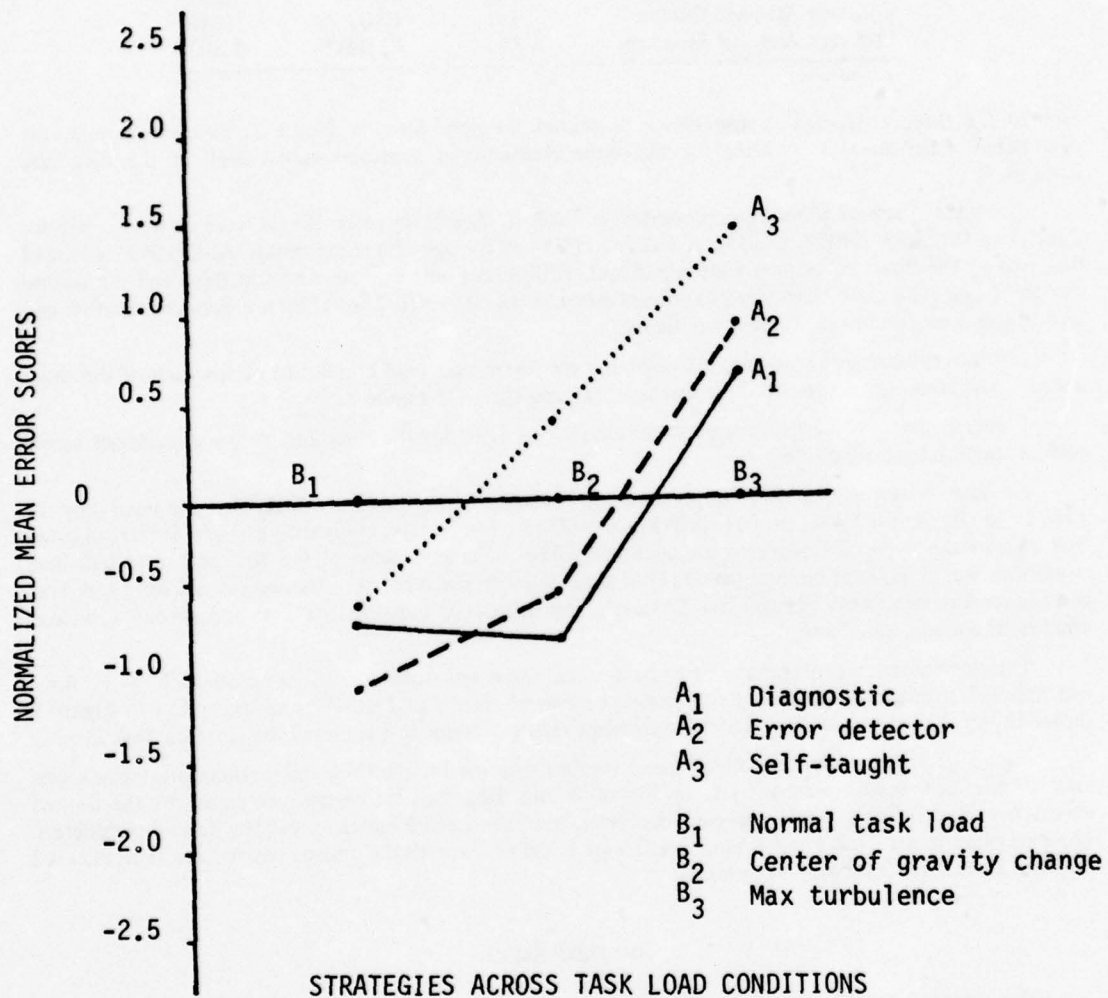


Figure 7. Normalized mean error scores as a function of instructional strategies across task load conditions for constant airspeed climbs.

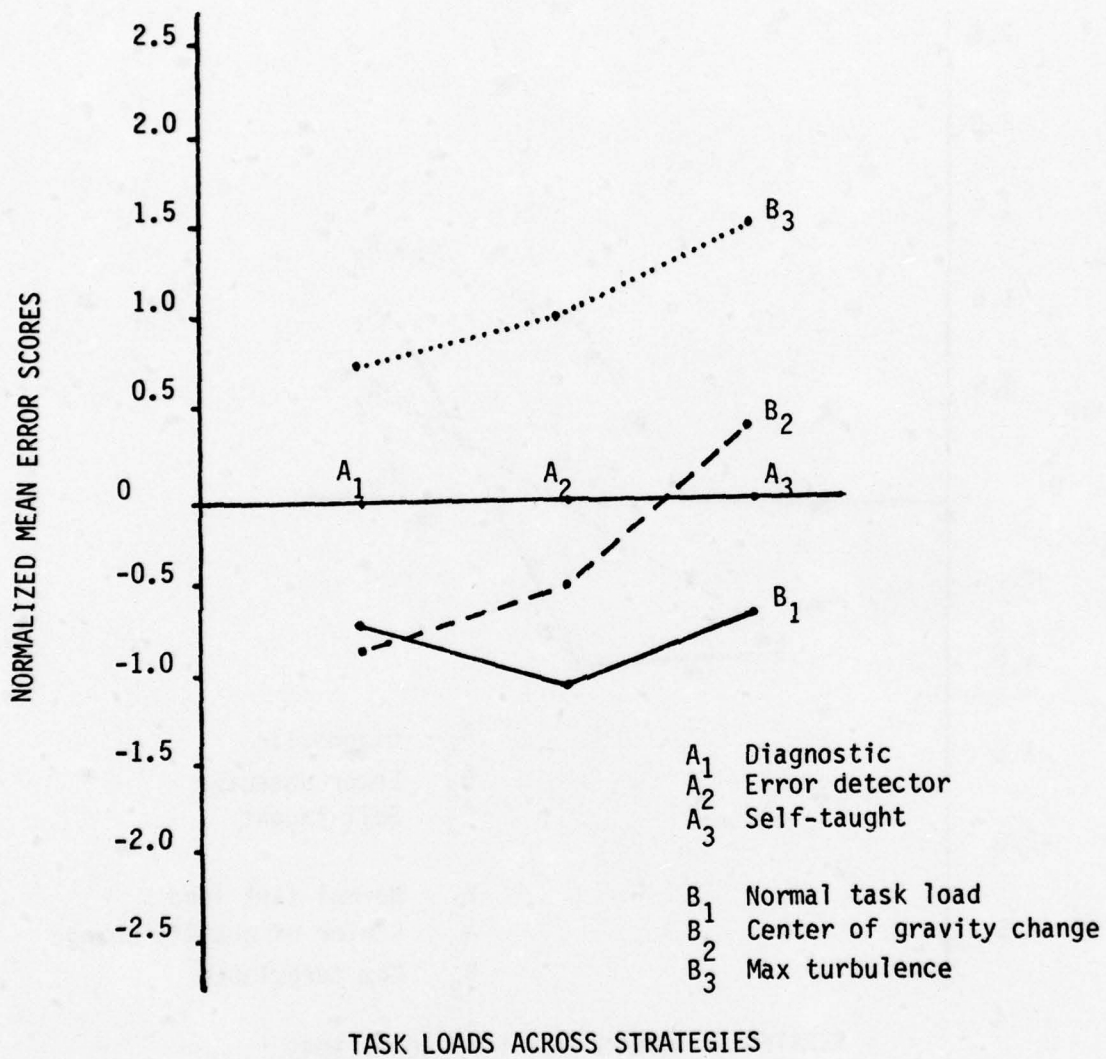
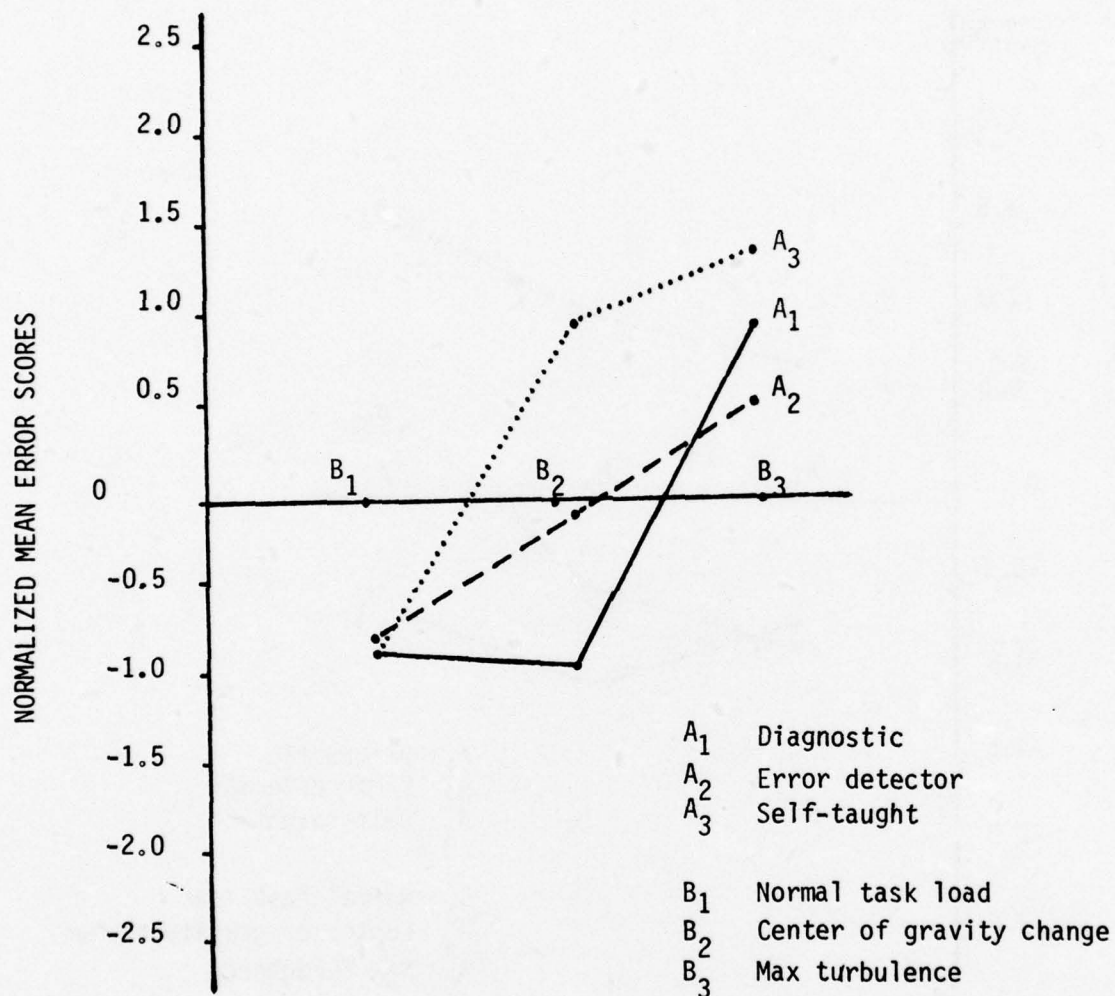


Figure 8. Normalized mean error scores as a function of task load conditions across instructional strategies for constant airspeed climbs.



#### STRATEGIES ACROSS TASK LOAD CONDITIONS

**Figure 9. Normalized mean error scores as a function of instructional strategies across task load conditions for constant airspeed descents.**

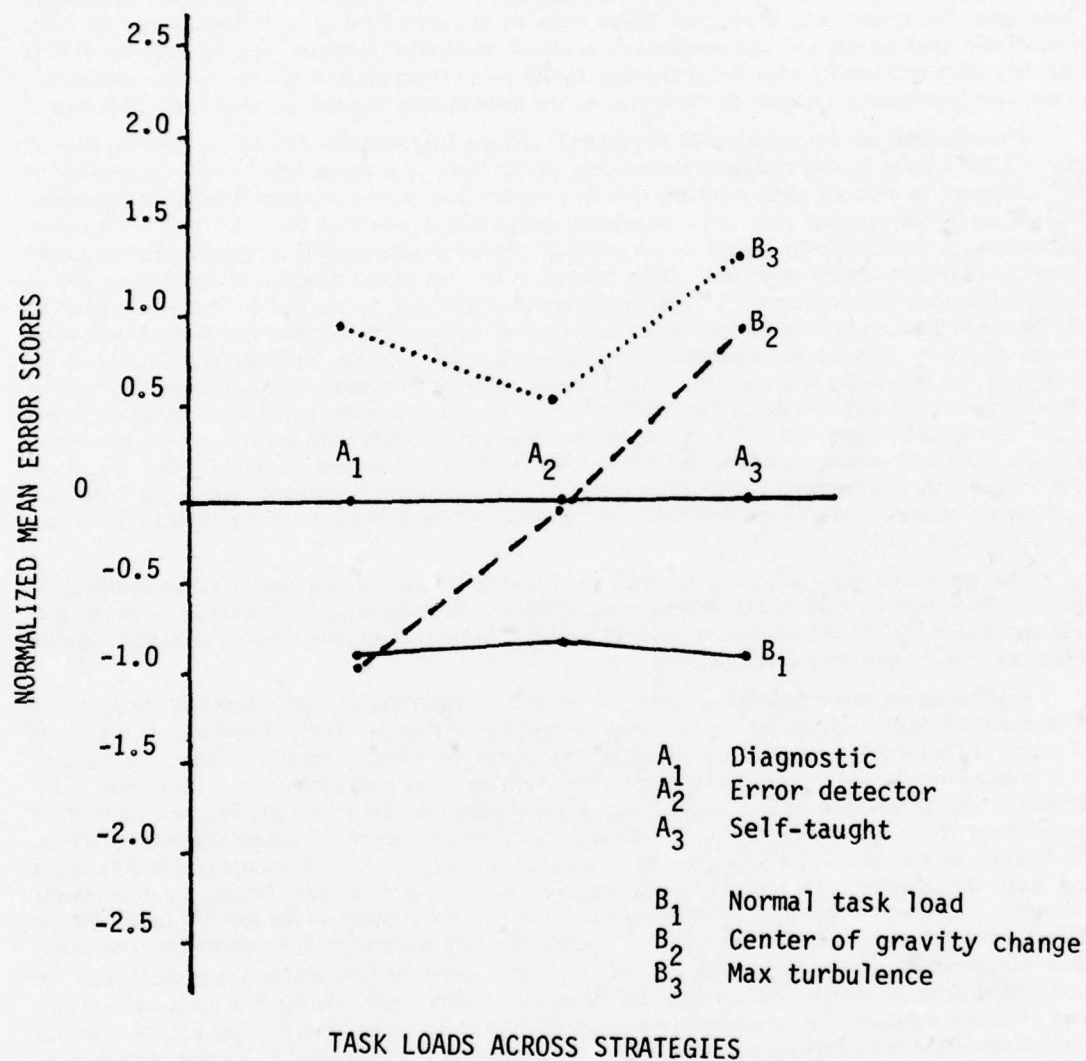


Figure 10. Normalized mean error scores as a function of task load conditions across instructional strategies for constant airspeed descents.

1974). Other studies by Bass and Vaughan (1966) found that accurate feedback furnished information with which mistakes were corrected and performances improved; i.e., the more accurate and specific the feedback of results were, the more readily the learner made correct responses.

While the majority of conclusions are generally favorable for the use of knowledge of results in motor skills learning, they have not been universally accepted. One point in particular which may explain the lack of significant differences between the diagnostic, error detector and self-taught strategies is found in Hilgard and Bower (1966): It is stated that in a well-cued program there are few errors which are not intrinsically "built into" the system; i.e., the learner knows when he has committed an error by observing the cues, without the need for any external verification. A similar observation has been made by Eddowes (1974) regarding what is learned during flying training. In the T-40 trainer (as well as other similar simulators), errors were immediately apparent to the learner via the flight instruments and the simulator's motion cues.

These findings are compatible with the findings of Caro, Islay, & Jolley (1968) and Thomas, Caro, & Boyles (1967). These studies evaluated the learning performance of students who "taught themselves to fly" compared to students given no flying time in a captive, but flyable, one-man Whirlymite helicopter. Caro et al. (1968) reported that two experimental groups which practiced for 3 1/4 and 7 1/4 hours, respectively, in the Whirlymite trainer (as compared to two control groups with no practice) had improved trainee performance during subsequent flight training and a two-thirds reduction in eliminations due to flying deficiencies. The implication of these results indicate that students can and do "teach themselves to fly" and that those students given the opportunity showed improved performance over students who were taught strictly by conventional techniques in helicopter training programs. Since the performance of the students in the self-taught strategy was not significantly different from those students in the diagnostic or error detector groups, the results of the Whirlymite helicopter studies were not validated. However, it was found that the self-taught method of training did not produce a decrement in performance in comparison with the other two techniques which used more verbal feedback and instruction from the IPs. Also, there was no significant improvement in performance over task loaded conditions using the self-taught technique, as compared to the transfer to training conditions described in the helicopter training studies (Caro et al., 1968; Thomas et al., 1967).

The significant main effects of the task load conditions over all maneuvers led to comparisons between the means for each of the combinations. With the exception of the difference between the first and second task load conditions on the constant airspeed climbs and constant airspeed descents, all other differences for all maneuvers were significant.

In the constant airspeed climbs and descents, the student's performance was affected by the nature of the second task load condition; i.e., a shift of the center of gravity longitudinally. The change of the center of gravity made the simulator heavier in the front. This caused the nose to drop into a descent and required back pressure on the yoke to hold straight and level flight and a trim adjustment from the normal 2 1/2 degrees to approximately 5 degrees. Trim adjustments throughout the five maneuvers were very small. Prior to giving control to the student for the straight and level maneuver under the second task load condition, the IP again set the trim to 2 1/2 degrees. When the student was given control and directed to fly straight and level, the simulator was programmed to enter an unanticipated descent. During the four-minute maneuver, each student had time to retrim and ease the forward pressure on the controls caused by the shifted center of gravity. Most of the students "solved" the trim problem during straight and level flight. Since the center of gravity change affected only pitch trim, once the trim setting was made to hold the proper pitch with minimum yoke pressure, the climb and descent maneuvers for task loads one and two were of similar difficulty. This occurrence was apparent in the diagnostic strategy group only because this group received the most thorough information on the use of trim. Trim was covered through error analysis during the practice segments. The error detector strategy group received only heading, altitude, airspeed and bank deviation information during the practice segments; trim was not a deviation cue. The self-taught students received no IP feedback during practice.

As previously indicated, the critical comparisons were between the three instructional strategies groups. There were no statistically significant differences obtained. In other words, the self-taught group trained with limited instructions and no extrinsic feedback during practice segments performed as well as the error detector group which received thorough instructions and immediate, though limited feedback and the diagnostic group which received thorough instructions and timely error analysis throughout.

These results indicate that the students learned the necessary skills regardless of the instructional strategy applied. The lack of significant differences between strategies further indicates that all the students attained comparable proficiency regardless of strategy. Given enough motivation, such as the desire of a student pilot to learn to fly, a person will succeed under various stressful conditions. The intrinsic motivation of the typical pilot candidate is high (Lohmann, 1974). Advances in the sophistication of screening techniques have improved the process of differentiation, which attempts to identify the prerequisite skills and knowledges for pilot training. Consequently, it is possible to determine a higher percentage of candidates who will succeed in pilot training. After the conclusion has been drawn that the three strategies applied are comparable, the implications for a decision on which approach to use no longer are based on which is the best. The question becomes one of deciding on which is the easiest strategy to apply or most expeditious or least expensive.

The results of this study provide direction for follow-on research and may lead to the incorporation of new training methodologies in present syllabi for use in advanced flight simulators. If detailed instructional strategies can be applied to training programs which will meet the required levels of effectiveness, minimize the cost of training, and optimize the time spent in simulators, flight training overall will be optimized. From the results of the instructional strategies study come some further implications for future research which may well lead to the optimization of flight training in state-of-the-art and future advanced simulators.

#### **Implications for Future Research**

One of the most important implications for future simulator training operations is the potential for saving IP manhours in simulator training. One direction for future research is the investigation of computer controlled or assisted mission simulators. The results of the present study indicated that there were no significant differences between the instructional strategies applied. This finding suggests that the error detector method and feedback function used in the instructional strategies study is currently available on the advanced simulator for undergraduate pilot training (ASUPT) and can be used to replace a number of typical IP functions. The ASUPT also has a preprogramming capability with synchronized demonstration, performance record/playback, and performance measurement features.

To illustrate a hypothetical training situation as shown in Figure 11, a typical simulator sortie has been depicted in its three basic parts; i.e., preflight, flight, and post-flight. The preflight portion is typically an IP-to-student briefing concerning areas such as mission profile, the type of maneuvers to accomplish, the specifics of each maneuver, and other topics related to the sortie. The flight portion is a mix of instruction and practice. The post-flight portion is a debrief of the flight including evaluation of the student's performance, and sometimes identification of maneuvers to be accomplished on the next sortie. In our hypothetical situation, a sortie requires 90 minutes of an IP's time.

Figure 12 shows that the total time, required by an IP to conduct a typical simulator sortie, could be reduced by using computer error detection in much the same manner as the instructor error detection was used in the study. Computer error detection has the advantage of being more standardized for comparative measurement. Also, a computer printout could be generated from which to debrief.

A further reduction of IP time could be made by replacing the IP in the instructional part of the flight with a preprogrammed demonstration and synchronized audio taped voice instructions. Figure 13 shows the reduction of time where the student is solo for the entire flight portion receiving instructions, performance measurement and proficiency advancement information from the computer.

Another reduction of time could be made by replacing the preflight brief with media cognitive pretraining similar to the approach used in the instructional strategies study. The preflight brief could be made to present information specific to the sortie to be flown. Figure 14 shows a simulator sortie where the student views a specific media pretraining presentation followed by a preprogrammed and computer controlled flight. All of these could include a computer printout scoring system and a specially formatted debriefing narrative.

The last consideration in the generation of a computer controlled and assisted training hypothesis is a computer generated debriefing tool. The ASUPT has the capability to record and measure performance, automatically advance a student based on attained proficiency, demonstrate "perfect" maneuvers, and a number of other advancements. A debriefing printout could be designed to include individual maneuvers and overall performance grading, the kind and quantity of errors, suggestions for improvement based on

| Portion | Preflight              | Flight                          | Postflight            | Total IP Time Required |
|---------|------------------------|---------------------------------|-----------------------|------------------------|
| Time    | 15 Minutes             | 60 Minutes                      | 15 Minutes            | 1 Hr 30 Min            |
|         | IP-to-Student Briefing | Mix of Instruction and Practice | Debrief-IP-to-Student |                        |

Figure 11. A typical sortie.

| Portion | Preflight              | Flight  | Postflight                                    | Total IP Time Required |
|---------|------------------------|---|---|------------------------|
| Time    | 15 minutes             | 20-35 min //////////////  | 15 minutes                                    | 55-60 minutes          |
|         | IP-to-Student Briefing | Instruction on maneuvers first; then the student practices alone with computer error detection. | IP-to-Student Briefing with Computer Printout |                        |

Figure 12. A reduction in IP time by the addition of computer generated error detection.

| Portion<br>Time | Preflight                 | Flight   | Postflight   | Total IP<br>Time Required |
|-----------------|---------------------------|--|--|---------------------------|
|                 | 15 minutes                | ////////////////////   | 25 minutes*  | 40 minutes                |
|                 | IP-to-student<br>Briefing | Computer demonstrates<br>maneuvers, gives in-<br>struction, detects<br>errors, and measures<br>performance | IP-to-<br>student<br>debrief<br>with<br>computer<br>printout |                           |

\*Postflight time might have to increase slightly when interpreting computer printout performance data.

Figure 13. A reduction in IP time by the addition of preprogrammed instruction.

| Portion  |  | Total IP Time Required                     |  |
|--|--|--|--|
| Time   |  | 25 minutes                                 |  |
| Preflight                                      | Flight   | Postflight                                 |  |
| //////////                                     | //////////   | 25 minutes                                 |  |
| Audiovisual briefing of conduct of the flight. | Computer demonstrates maneuvers, gives instructions, detects errors, and measures performance. | IP-to-student brief with computer printout |  |

Figure 14. A reduction in IP time by the addition of media cognitive pretraining, automated instruction, computer.

type(s) of errors, suggested reading or learning center media assignments, and many other items. Figure 15 illustrates a totally computer controlled and assisted simulator sortie with media cognitive pretraining and computer debrief.

Given the results of the present study and the capabilities of the ASUPT, it is suggested that a subsequent study evaluate the strategies in simulator performance growth and the transfer of this training to the aircraft as compared with the typical diagnostic approach to furnish an empirical test of the possibilities developed above in the discussion of implications.

## V. SUMMARY AND CONCLUSIONS

This study investigated the use of three alternative instructional strategies in the training of basic instrument maneuvers in a T-40 simulator trainer under normal conditions and under task load conditions. The three strategies were diagnostic instruction which used immediate feedback through error analysis, error detector instruction using limited feedback through heading, altitude, airspeed, and bank deviation, and self-taught instruction where the students practiced all maneuvers solo receiving no IP feedback. The task load conditions were: (a) normal conditions during which the students performed with no task loading, (b) a change in the center of gravity from normal to full forward and (c) a change in the turbulence from zero to maximum. The criterion sortie was conducted with task load one first, task load two second, and task load three last. During each task load condition all five maneuvers were flown. Each of the 27 students flew Sortie 4 under identical conditions.

The results of the data indicate that there were no significant differences between the three instructional strategies. In other words, the students of any one strategy performed equally as well as the students of either of the other two strategies. These findings suggest the potential for additional computer application in simulator training programs.

The results of the data further indicate that there were significant differences between task load conditions. With two exceptions previously noted, a decrement in performance was found when the students flew the maneuvers with the center of gravity change and an even greater decrement when they flew with maximum rough air.

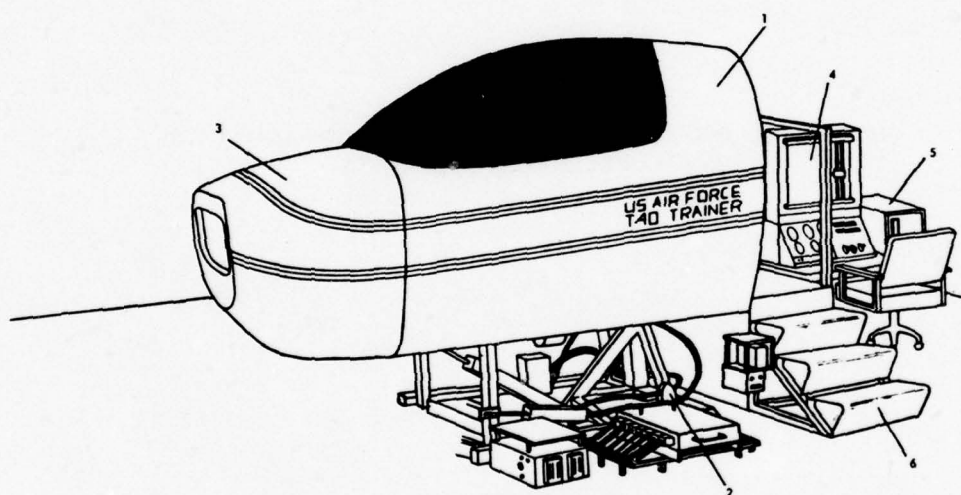
| Portion | Total IP Time Required         |  |   |
|---------|--------------------------------|--|---|
| Time    |                                |  | 0                                       |
|         | Preflight                      | Flight   | Postflight                              |
|         | //////////                     | //////////   | //////////                              |
|         | Media Cognitive<br>Pretraining | Automated instruction<br>and performance<br>measures | Computer<br>product<br>self-<br>debrief |

Figure 15. A reduction in IP time by the addition of computer controlled sortie and computer generated self-debrief.

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**APPENDIX A: INSTRUMENT FLIGHT TRAINER, TYPE A/F37A-T-40  
AND CONSOLE CONTROL PANELS**



- |   |                        |
|---|------------------------|
| 1. Cockpit Assembly                         | 4. Instructor Console  |
| 2. Motion Base                              | 5. Card Reader         |
| 3. Nose Section (Computer,<br>Power Supply) | 6. Stairs Installation |

Instrument Flight Trainer, Type A/F37A-T40

### TRAINER CONTROLS

|                     |                    |                    |       |                   |                   |
|---------------------|--------------------|--------------------|-------|-------------------|-------------------|
| PWR AVAIL<br>PWR ON | HYDRAULIC<br>POWER | MOTION<br>ON       | SPARE | HEADING<br>SLEW   | SPARE             |
| PROBLEM<br>FREEZE   | ALTITUDE<br>FREEZE | POSITION<br>FREEZE | SPARE | ALTITUDE<br>RESET | POSITION<br>RESET |

### FAILURES

|                |                 |       |                        |                   |                 |
|----------------|-----------------|-------|------------------------|-------------------|-----------------|
| VOR/ILS        | TACAN           | ADF   | GLIDE<br>SLOPE<br>FLAG | STEER<br>BARS ADJ | LANDING<br>GEAR |
| LEFT<br>ENGINE | RIGHT<br>ENGINE | FLAPS | ADI                    | ARU-20/A          | DIR<br>GYRO     |

#### WIND

FROM

KNOTS

#### ROUGH AIR

#### CG CONTROL

#### BARO PRESS

#### FIELD ELEVATION

MANUAL

#### O.A.T.

#### GROSS WEIGHT

#### FUEL

QTY

FILL

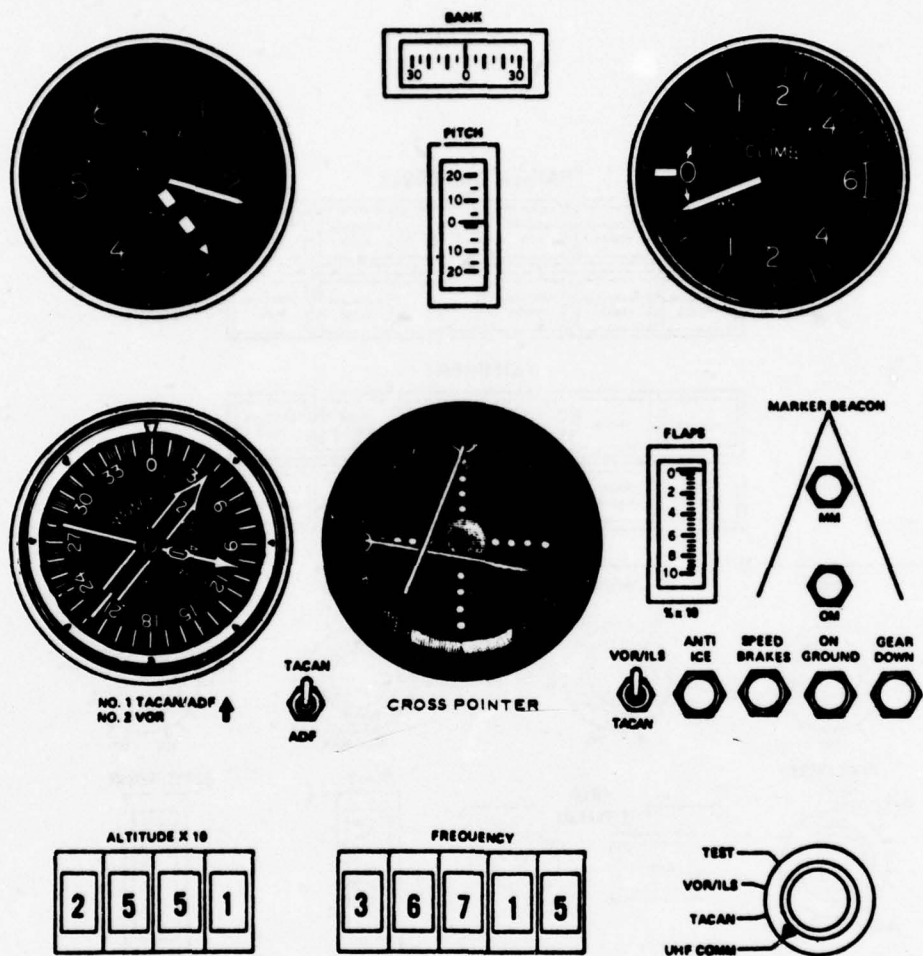
DRAIN

CTR

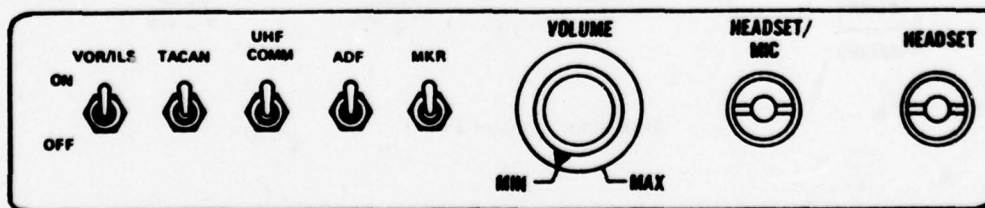
#### O.A.T. DEVIATION

#### PAYLOAD

Instructor Control Panel



Instructor Repeater Control Panel



communications control panel

**AIR FORCE**



**HUMAN RESOURCES**

**LABORATORY**

*APPENDIX B: T-40 INSTRUCTIONAL STRATEGIES  
PRETRAINING GUIDE*

Flying Training Division  
Williams Air Force Base, Arizona 85224

**AIR FORCE SYSTEMS COMMAND**

**BROOKS AIR FORCE BASE, TEXAS**

## PRETRAINING GUIDE

### General

I. OBJECTIVE: To investigate the effects of alternative flight training instructional strategies upon learning and transfer of training under conditions of task loading.

II. INTRODUCTION: You will be participating in a flight training study conducted by the Air Force Human Resources Laboratory, Flying Training Division, Williams AFB, AZ. You will receive four flights in the T-40. Due to the criticality of data collection and scheduling, you will be in a very controlled environment. It will be each individual subject's responsibility to assure attendance for all briefings and trainer flights. All briefings and training will be conducted in the AFHRL Building P-558, at Williams AFB, located near the corner of First Street and D Street. You will be given a tentative schedule including briefings and flight times. Any changes to your schedule will be passed on to you as early as possible for your convenience, however, unavoidable last minute changes may occur in the event of equipment failure. In the latter case, it will be very important that you try to adjust your time if at all possible.

### III. PRETRAINING GUIDE SEGMENTS (PG):

A. Narrative Description: The PG is the narrative description of the training device (T-40), basic principles of flight, a discussion of attitude instrument flying, and a description of the five flight maneuvers you will be taught. You will be expected to read the entire PG prior to the first trainer lesson. There may be some areas you won't understand. If this is the case, make a note of your questions

and present them to your instructor during the preflight briefing of your first flight.

B. Preflight Briefing: The first lesson will be one hour, twenty minutes (1+20) to include a 30-minute preflight brief about the lesson maneuvers and the T-40. It will be conducted by your instructor pilot (IP) immediately prior to lesson (hereafter referred to as sortie) one. This is the time to ask your questions about the PG.

C. Flight Maneuvers: You will be given instruction on five basic instrument maneuvers: straight and level flight, 30° bank turns to the left and right to heading, and constant airspeed climbs and descents. These maneuvers are designated A-E respectively.

D. Critique: You will receive a critique to be filled in at the completion of your training. We ask that you be objective and candid in your responses.

#### Pretraining Guide

I. T-40: The Instrument Flight Trainer, Type A/F37A-T40 is designed to train flight personnel in the cockpit environment of a typical utility twin-engine jet aircraft. The purpose of the trainer is to provide a high degree of training in instrument flight, radio communication, navigation, and engine systems for this type of aircraft.

The trainer (Figure 1a) consists of a cockpit shell mounted on a two-degree-of-freedom motion system, a hydraulic pump unit, and an instructor station. The nose section of the cockpit contains power supplies and components of the solid-state hybrid computer, and the flight compartment resembles a functional environment of pilot and copilot stations. The hydraulic pump unit that supplies hydraulic power to the

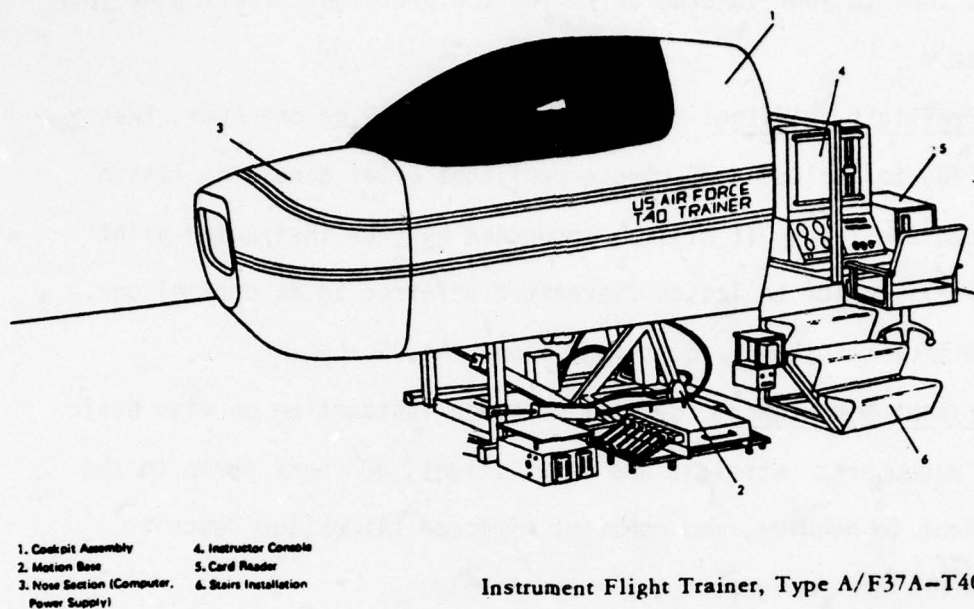


Figure 1a. T-40

motion system and control loading system is located beneath the stairs platform at rear of the cockpit. Located on a desk external to the cockpit is the instructor station. All these major components are extensively interfaced to provide maximum utilization of the trainer's capabilities.

The interior of the flight compartment, including the controls, instruments, equipment, and furnishings, is typical of the aircraft represented. Two seats with upholstered backs, cushions, and seat belts are provided for the pilot and copilot stations. Seat adjustments are included for raising, lowering, and longitudinal control. Center

pedestal panels are located between the two seats. A jump seat for an instructor/observer is located behind the copilot seat.

A hydraulically powered control loading system provides realistic control feel in the two primary modes of flight control (longitudinal and lateral).

The two-degree-of-freedom motion system provides kinesthetic sensations to the flight crew, similar to those experienced in real flight, but limited in magnitude and period of sustainment by the limitations of the hardware and motion envelope. The performance of the system is such that trainer movement gives correct and realistic cues to the flight crew in all normal and abnormal maneuvers. The trainer is imperceptively returned to a level position as soon as the conditions causing accelerations return to neutral. The motion system is capable of providing motion in the pitch and roll axes. The pitch motion also provides vertical translation at the pilot's center of gravity to simulate a third axis cue.

Entry and exit to and from the simulator will be explained as you enter for the first sortie. Operation of the controls and cockpit equipment will be covered by your IP during the preflight briefing and during sortie one. Figure 1b is a display of the cockpit and instrument panel layout.

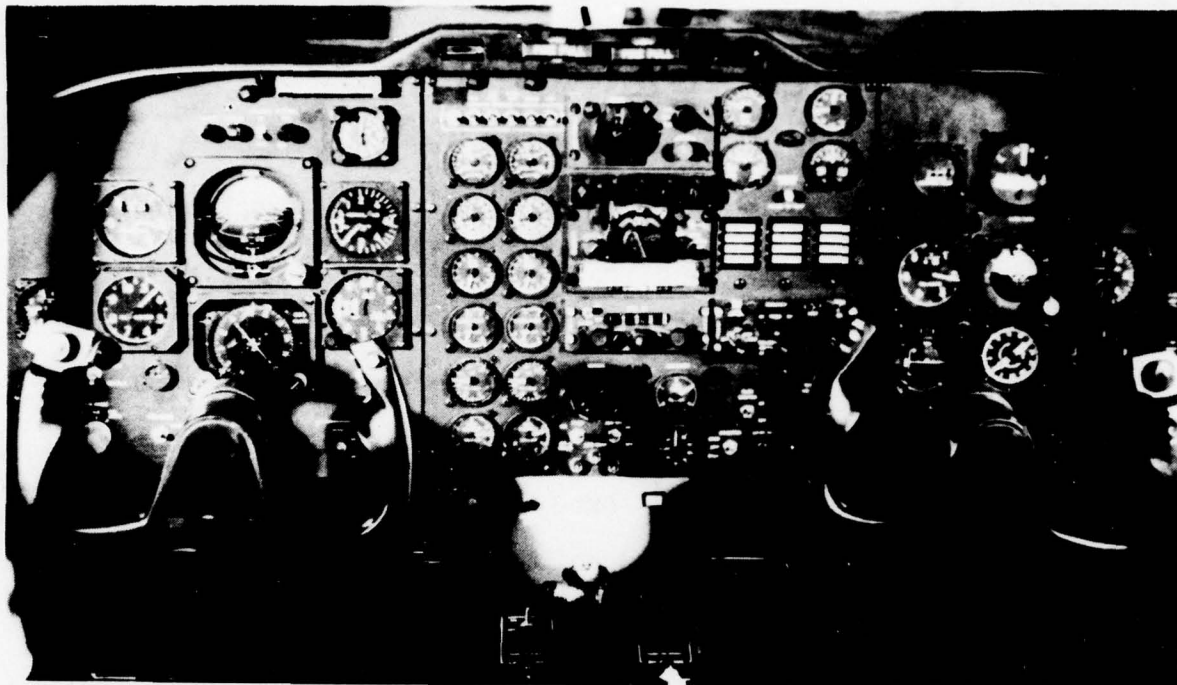


Figure 1b. Cockpit Layout

The primary consideration held above the objective of the study is safety for individuals and equipment. In the interest of safety, we require timely compliance with all instructions related to the use of the equipment in the trainer bay. There are numerous caution and warning signs posted in the building. Please take note of them when you're in the building.

## II. BASIC PRINCIPLES OF FLIGHT

A. Lift vs Weight: Lift (L) is a direct result of the relationship between air and the moving aircraft. When an aircraft is moving through the air at a constant airspeed, a differential pressure is formed on

the wing resulting in an upward force measured in pounds. If an aircraft weighs 6000 lbs, the wings must generate 6000 lbs of lift to maintain level flight. Since the pilot cannot directly control weight ( $W$ ), he must control lift to balance the forces for level flight. This is done by moving the control yoke forward or aft to generate or destroy lift. Figure 2 shows the side view of an aircraft in level flight labeled with basic force vectors.

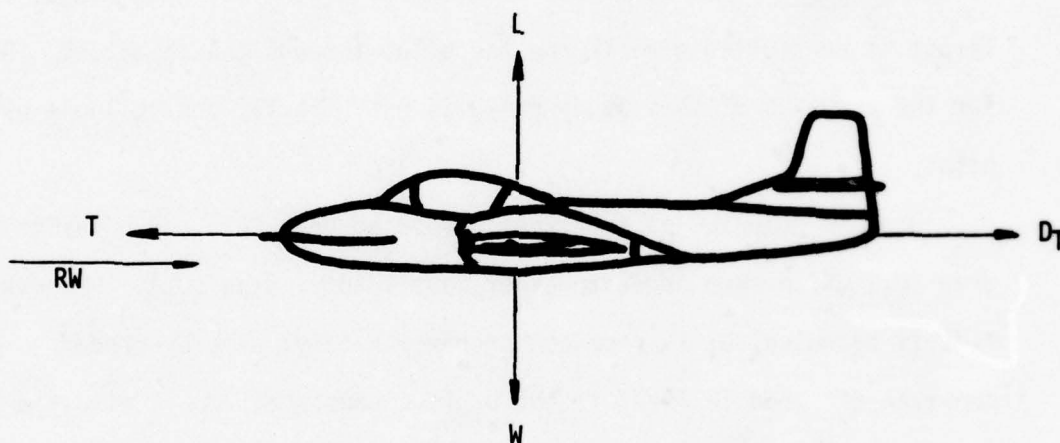


Figure 2. Straight and Level Flight

Weight always acts perpendicular to the surface of the earth. Lift always acts perpendicular to the longitudinal and lateral axes. In level flight at a cruise airspeed, the lift and weight vectors are

basically equal and opposite. In reality, lift is composed of two components: the vertical component ( $L_v$ ) and the horizontal component ( $L_h$ ). In Figure 2  $L_v$  is coincidental with  $L$ . Therefore,  $L_h = \text{zero}$ .

B. Thrust vs Drag: Thrust ( $T$ ) is the force generated by the engines to propel the aircraft through the air to generate lift. Drag ( $D_t$ ) is the force acting on the aircraft to slow it down. When the two are equal the aircraft maintains a constant airspeed. The relative wind is the flow of air opposite to the flight path of the aircraft. It is as if the aircraft never moved but a strong wind blew over the wings. Thrust is controlled directly by the pilot through the throttles. Drag, for the purposes of this study only, is not directly controllable by the pilot.

Drag is composed of two types: Induced drag ( $D_i$ ) and parasite drag ( $D_p$ ) which when added together equals total drag ( $D_t$ ). Whenever lift is produced,  $D_i$  is produced proportionately, as a by-product. At a constant airspeed in level flight  $D_i$  is a constant.  $D_p$  is simply a result of the friction of the air on the surface of the aircraft and for purposes of this study will always be constant. Therefore, in level flight total drag ( $D_t$ ) is changed with changes in lift controlled by the pilot. Figure 2 shows the thrust and drag vectors.

C. Turning Flight. When a turn is desired, the aircraft must be rolled into a bank (normally  $30^\circ$ ) and stabilized. If the airspeed is constant, lift will not change. But in a banked attitude, lift is not directly opposing weight.  $L_v$  now must oppose weight. To make  $L_v = W$ , lift must be increased by pulling back a slight amount on the yoke. When  $L_v = W$ , the forces that keep the aircraft in a level turn are balanced.

In a bank,  $L_h$  is also produced. This force turns the aircraft. Figure 3 shows a rear view of an aircraft in a turn to the left labeled with the lift vector and its component vectors.

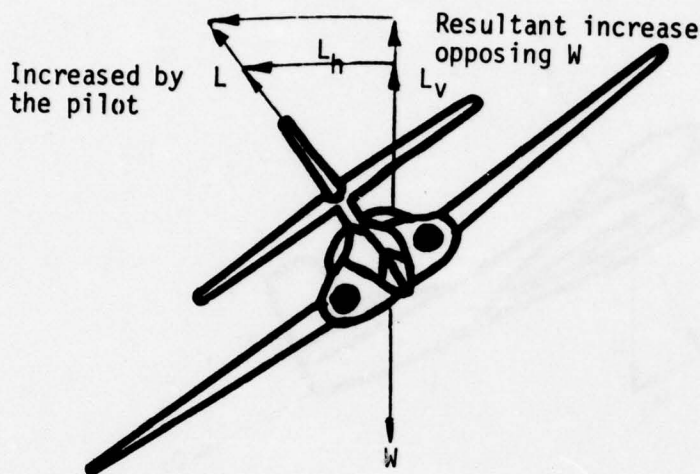


Figure 3. Left Turn (Rear View)

When the pilot pulls back on the yoke to increase lift so  $L_v = W$ ,  $D_i$  is generated. With this increase in total drag, thrust will have to be increased enough to balance  $T$  and  $D_t$  and maintain airspeed.

In summary, to maintain a level turn at a constant airspeed, the yoke must be pulled back and the power increased slightly. Too much/little back pressure or too much/little power will not properly balance the forces and cause the aircraft to deviate from stable conditions;

i.e., too much back pressure in a turn will cause the aircraft to climb.

D. Climbing Flight: When a climb is desired, the pitch attitude will have to be increased some estimated amount to change the flight path from straight ahead to upward.

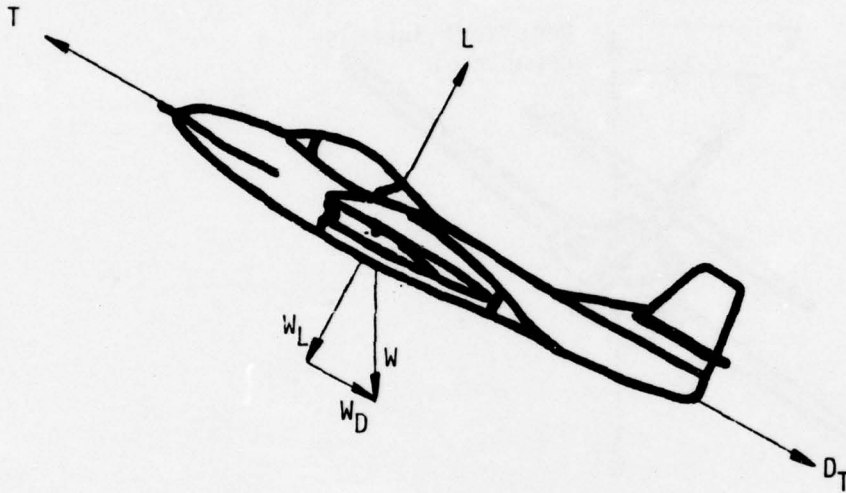


Figure 4. Level Climb

If it is desired that the power be increased to the maximum, the pitch attitude of the aircraft will be the factor that controls a constant air-speed. In a climb, weight converts to two components: the component opposing lift ( $W_L$ ) and the component supplementing drag ( $W_D$ ). Since thrust is increased some measured amount,  $W_D$  will have to be increased enough to make the new  $D_t = T$ . Changes in pitch will change  $W_D$ . Keeping

the airspeed constant is the only way the pilot knows the forces are balanced (see Figure 4).

E. Descending Flight: When a descent is desired the pitch must be decreased some estimated amount to change the flight path from straight ahead to downward.

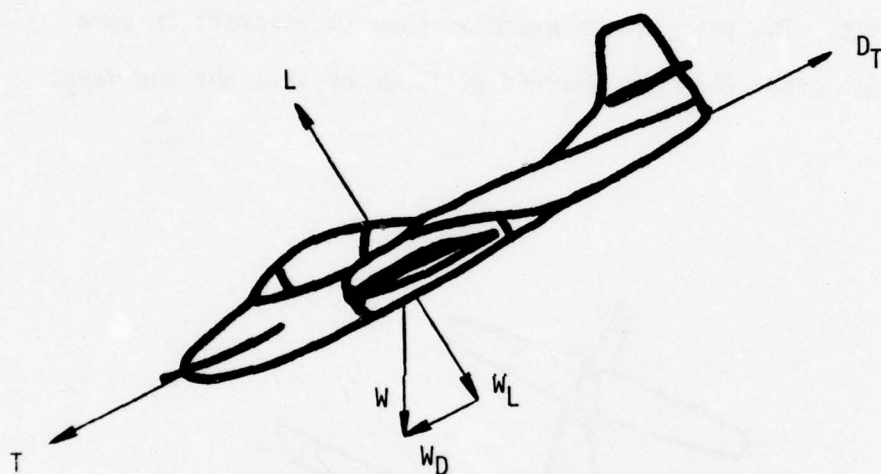


Figure 5. Level Descent

Idle power will be used for constant airspeed descents. In a descent,  $W_D$  acts with thrust. The pitch is adjusted enough to keep  $W_D$  equal to the amount thrust reduced so the airspeed will be constant. As in a climb, with the thrust a constant (idle),  $W_D$  is varied by pitch attitude to maintain a constant airspeed (see Figure 5).

F. Correction for Deviations: It is important that you learn to recognize deviations from desired flight attitude parameters and the inputs required to correct for deviation. In the first example (Figure 6) straight and level flight is the desired condition. The example shows an aircraft in a descent to the left. To correct back to level flight, the nose must be raised by pulling aft on the control yoke, and by turning the yoke to the right until the aircraft is returned to straight and level flight. The rest of the examples show an aircraft in some flight attitude other than the desired attitude of straight and level

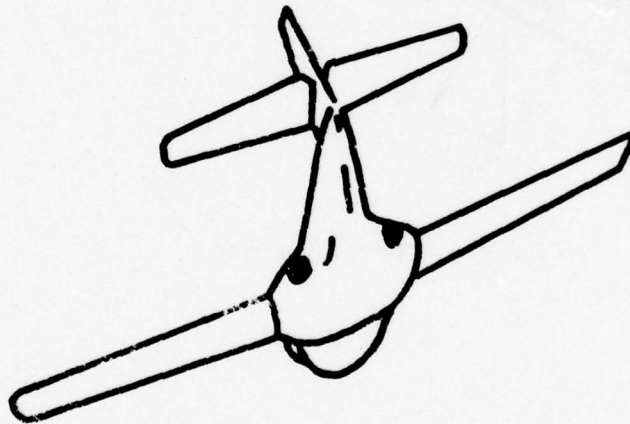
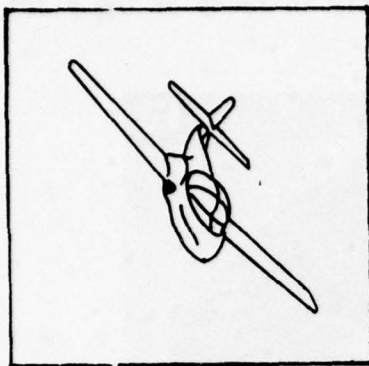
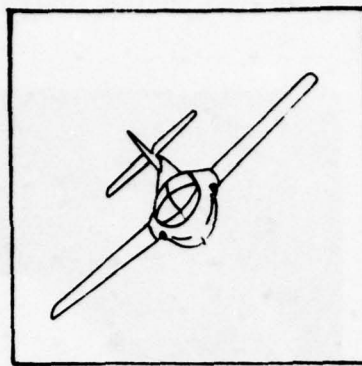


Figure 6. Straight and Level Flight Desired

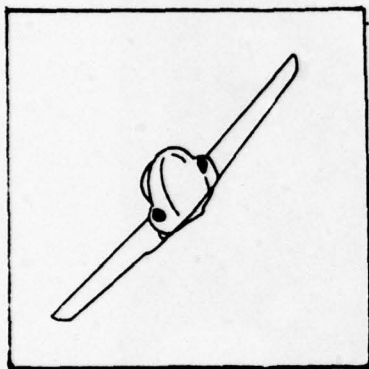
flight. At the bottom of each example are the basic inputs to correct for the flight attitude deviation.



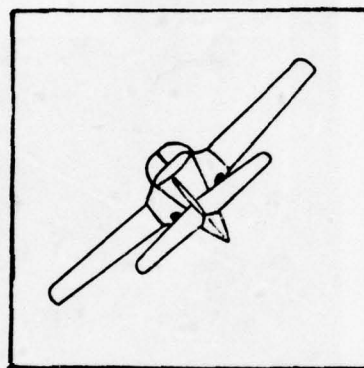
Control Yoke Right & Aft



Control Yoke Left & Aft



Control Yoke Forward & Left



Control Yoke Forward & Right

Figure 7. Incorrect Flight Attitudes

III. ATTITUDE INSTRUMENT FLYING: Flying an aircraft in a visual environment where reference to a natural horizon is available, the pilot obtains the majority of his information for aircraft control and flight attitude looking outside the windshield. However, in the absence of a visual horizon, such as flying in a cloud, the pilot must obtain this attitude information from the special instruments in the cockpit which artificially represent the outside world. From this requirement comes the concept of "ATTITUDE INSTRUMENT FLYING." Simply stated, this means that the attitude of the aircraft, i.e., its angle of bank or angle of pitch, is displayed on an attitude direction indicator (ADI), (Figure 8) or artificial

horizon located on the instrument panel directly in front of the pilot.

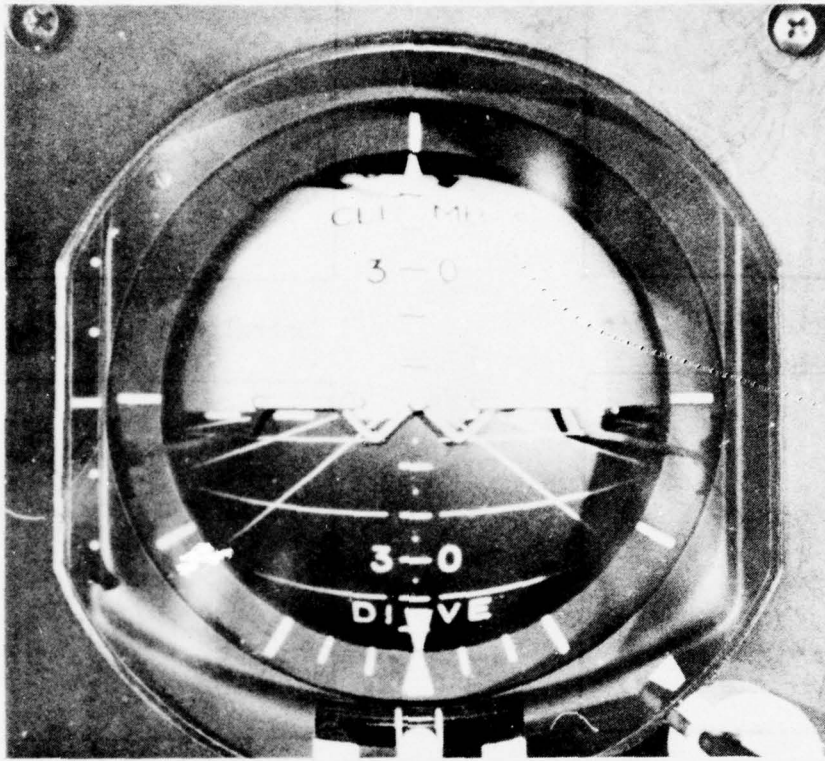


Figure 8. Attitude Direction Indicator

With this intricately calibrated instrument properly adjusted, the pilot can tell if he's climbing, descending, turning, or a combination. When the aircraft is straight and level, the ADI can be adjusted to superimpose the miniature aircraft symbol on the horizon line of the attitude sphere. In Figure 8, the miniature aircraft is above the dashed horizon line one bar width. This display can be adjusted to a level flight representation by turning the control knob in the lower right corner of the instrument. When subsequent changes in pitch are made (i.e., raising or lowering the nose), the angle of pitch can be measured by

referring to the calibrations on the sphere. The sphere is calibrated in degrees with increments every five degrees. The width of the miniature aircraft fuselage dot and wings is approximately  $2\frac{1}{2}^{\circ}$ .

This instrument alone, however, does not tell the whole story. Along with it, like in a car, are other instruments which will accurately provide performance information.

First, we have a speedometer called an airspeed indicator (Figure 9). It displays airspeed in nautical miles per hour, or knots. Unlike

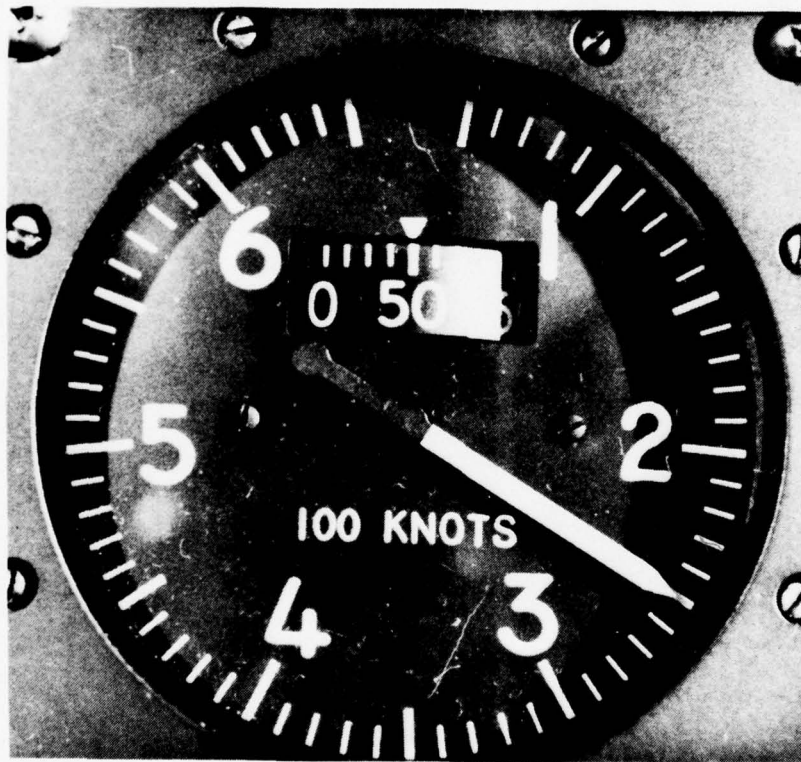


Figure 9. Airspeed Indicator

driving, an aircraft requires a certain minimum speed to stay airborne. In a car your concern for speed is the fine associated with excessive

speed. In an aircraft, your concern is keeping enough speed to maintain flight. The large pointer will indicate airspeed calibrated to 10 knots. The drum provides a more accurate reading to the nearest knot. Airspeed can be controlled with power or pitch or both.

Next is the altimeter (Figure 10). In a car, the terrain beneath

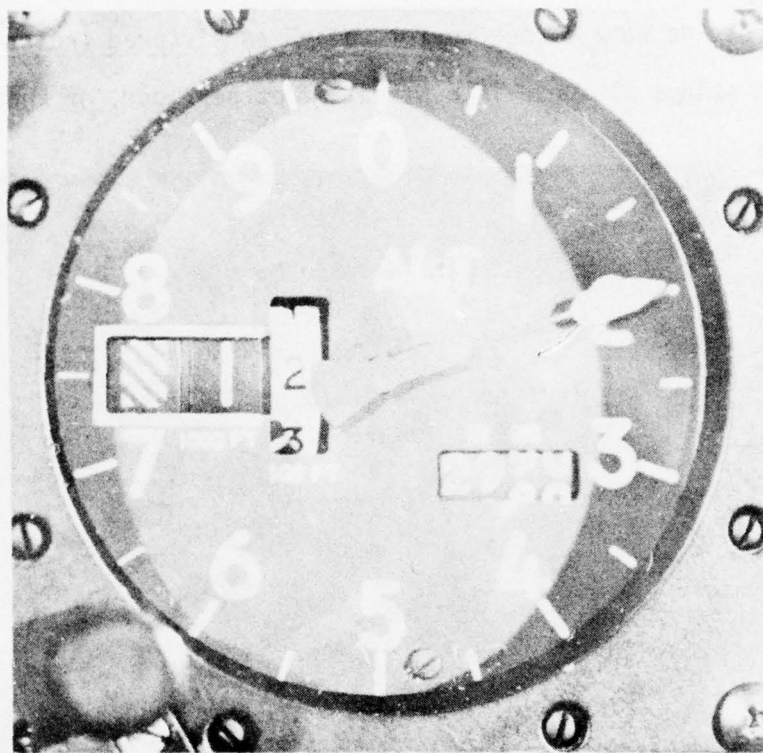


Figure 10. Altimeter

your wheels relieves you of that consideration. However, since an aircraft operates with the prime concern of staying off that terrain, an altimeter provides the information telling him how high the aircraft is. It is calibrated in 10s, 100s, 1000s and 10,000s of feet. The left digit drum has a 10,000' warning symbol (hash marks) which, when visible, tells the pilot he is below 10,000'.

Next is the vertical velocity indicator (Figure 11). When the aircraft is in a climb or descent, it is often important to know the rate.

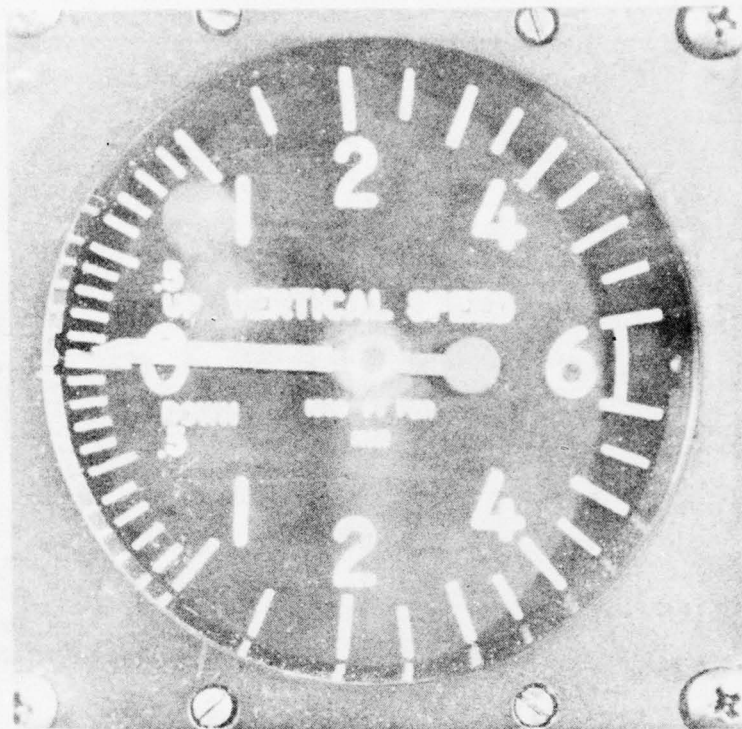


Figure 11. Vertical Velocity Indicator

Rate of climb or descent information is helpful to calculate the time required to change altitude a certain amount. The vertical velocity indicator (VVI) is an excellent instrument for quickly alerting the pilot to a deviation trend developing. It is calibrated in feet per minute. Climbs will be indicated when the needle is in the top portion of the case and vice versa for descents. The vertical velocity indicator is also used to calculate leadpoints for level offs.

The next instrument of primary importance is the heading indicator (Figure 12). Roads on the ground provide directional guidance for a car.

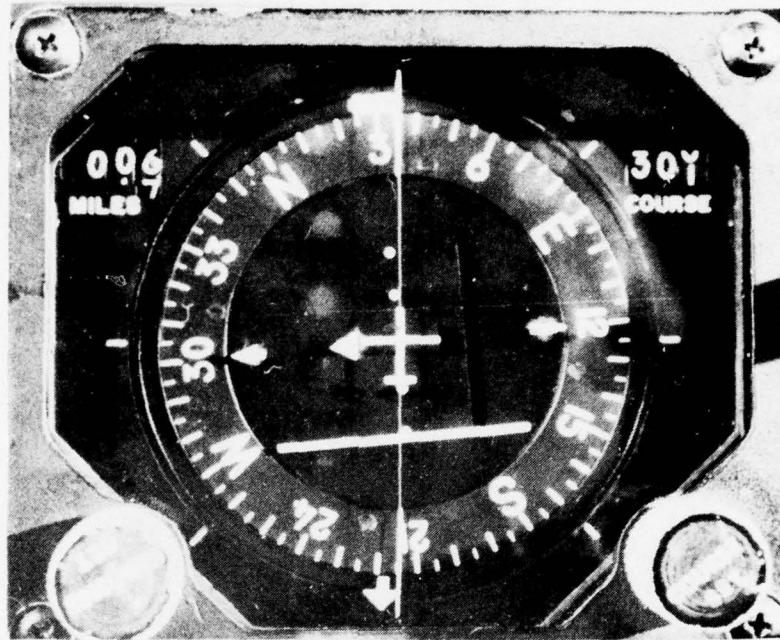


Figure 12. Heading Indicator

In the air however, we need a compass device to keep us on a "road." The heading indicator is calibrated in 5-degree increments on a compass card from North ( $360^\circ$ ) around either way to North again. For example, a heading of  $180^\circ$  is a heading due South. The heading is read under the hairline in the 12 o'clock position on the case. During a turn, the heading will be constantly changing. In straight and level an exact reading can be made.

Although all engine instruments are important in the operation of

an aircraft, the T-40 only requires you to be familiar with the tachometers (Figure 13). They are self-generating instruments which indicate

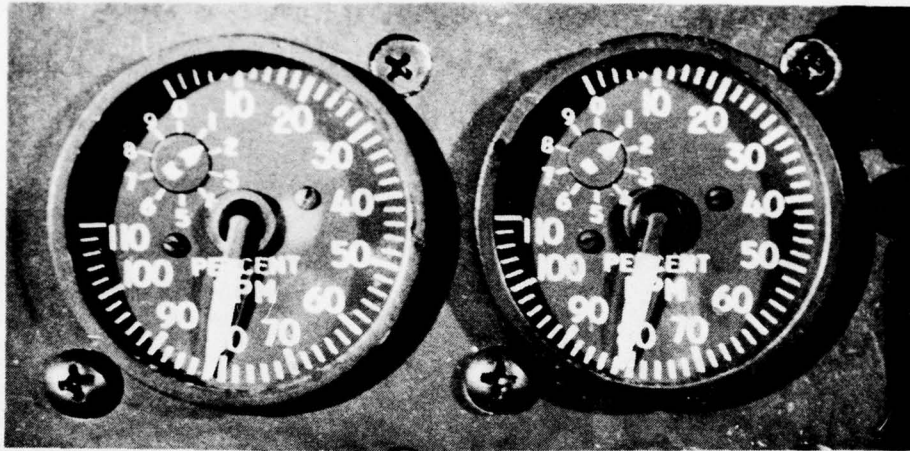


Figure 13. Tachometers

engine speed in percentage of rated RPM. The outer scale is calibrated in 2% increments. For readings as sensitive as 1/2%, the smaller pointer is used. You will use them as a means of selecting a desired engine power setting by moving the throttles located between the seats.

All of the instruments described thus far represent those which are most commonly used to keep you informed of aircraft control and performance. You may have noticed while driving a car that your eyes occasionally leave the road to check the speedometer or the gas gauge

or some other gauge. This is called a crosscheck and is of major importance while flying. Stated in other words, crosscheck is the division of your attention among the instruments in the cockpit to detect deviations and to maintain timely, orderly, and positive aircraft control. Figure 14 is a layout of the portion of the instrument panel you will be using.

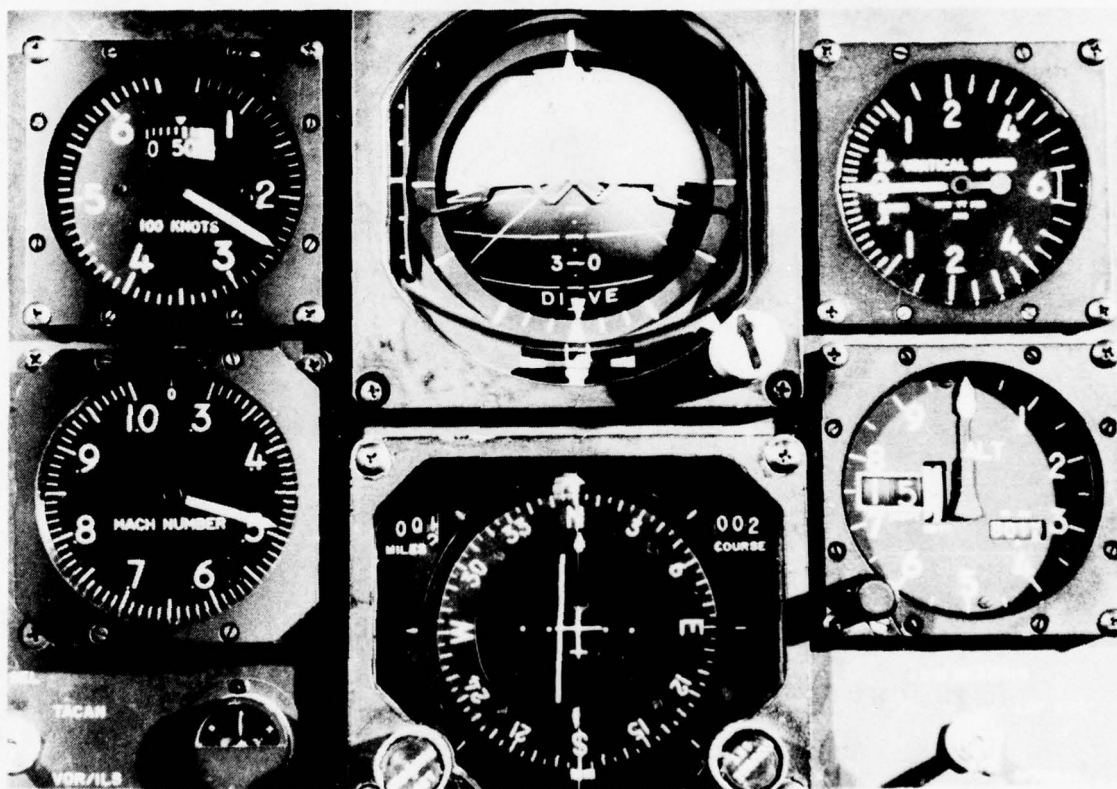


Figure 14. Left Instrument Panel - Straight and Level Flight

#### IV. MANEUVER DESCRIPTIONS:

Before we discuss each maneuver in detail, we will look at the concept of the crosscheck in more detail. There are two basic types: the centralized crosscheck where one or two instruments at the most require

almost full attention, and the rhythmic scan where your attention is divided among all the instruments with the attitude indicator at the center.

The centralized crosscheck is used when transitioning; i.e., entering a maneuver from a present steady state or exiting a maneuver to a steady state. The centralization on an instrument is necessary to establish new flight attitudes and power settings to control the aircraft. This central attention is most often on the attitude indicator.

The rhythmic scan is used when the aircraft is in a steady state; e.g., level turn, steady climb, etc. Here, the attitude indicator is monitored for attitude control information while the rest of your attention is divided among the performance instruments to detect deviations from desired parameters. If all the performance instruments are as desired, the crosscheck continues rhythmically. If there is a deviation, a correction is made on the attitude indicator. Then the scan resumes, paying particular attention to the instrument(s) with the deviation until the desired parameter is regained.

The exit transition differs from the entry in that, to reach the new desired parameters exactly, lead points will have to be determined at which the exit transition will begin. Various instruments, depending on the maneuver, will be used to determine these lead points.

A discussion of crosscheck is included in each maneuver description.

A. Straight and Level Flight (ST&L): Straight and level flight is a steady state condition where the four basic forces acting on the aircraft are balanced, i.e., lift = weight; thrust = drag, and airspeed,

altitude and heading are constant. Figure 14 is a depiction of the instruments as they should appear with the parameters established from the chart below.

#### ST&L

| A/S  | ALT | HDG  | VV   | PITCH | BANK  | POWER (RPM) |
|------|-----|------|------|-------|-------|-------------|
| 250K | 15M | 360° | ZERO | LEVEL | LEVEL | 81.5%       |
| C    | C   | C    | C    | V     | V     | V           |

C stands for constant and not normally changeable.

V stands for variable meaning it may vary as a result or may be intentionally varied to obtain a result.

K stands for knots.

M stands for 1000'

Deviations from airspeed in straight and level are corrected with power; deviations from altitude are corrected with pitch. Normally, you will interpret the altitude deviation in feet, double the value, and use a vertical velocity rate equal to the new value. For example, if altitude is off by 300', a rate of 600 fpm would be used to correct back. This provides a very controllable return to desired. Deviations from heading are corrected with bank. Normally, an angle of bank equal to the number of degrees of heading is used to correct back to desired, but never more than 30° bank. For example, if the heading is 20° off desired, 20° of bank would be used when turning back to the desired heading. Deviations from more than one constant are corrected with a combination of pitch, bank, and power. Straight and level can be considered the basic maneuver

unit of flight. From ST&L, turns, climbs, descents, and combinations of these are initiated. Your first flight will begin from a frozen state of straight and level flight at the parameters listed above.

The crosscheck of instruments in ST&L is a rhythmic pattern scan originating from the attitude indicator (representing the hub of a wheel) to the various performance instruments (as though looking out a spoke to the rim then back to the hub). If deviations are found on the performance instruments, the attitude indicator is used to make measured corrections to regain desired readings.

B & C. Normal 30° Bank Turn to a Heading: (B - to the left; C - to the right). (See Figures 15 and 16.) These two maneuvers are identical except for direction of turn. A level turn is a steady state condition where lift, weight, thrust, and drag are balanced at a constant airspeed, altitude, and angle of bank.

LEVEL 30° BANK TURN

| A/S  | ALT | HDG | VV   | PITCH   | BANK | POWER<br>(RPM) |
|------|-----|-----|------|---------|------|----------------|
| 250K | 15M | -   | ZERO | NOSE HI | 30°  | 81%+           |
| C    | C   | -   | C    | V       | C    | V              |

Deviations from airspeed in a level turn are corrected with power; deviations from altitude are corrected with pitch. In a steady state turn, heading is constantly changing. Notice that the turn parameters chart has no value for heading. Consideration for heading comes in prior to roll out on a specified heading. Notice also on the parameters chart that bank angle is a constant. In ST&L, bank is variable to keep

heading constant. In a steady state turn, heading is supposed to change, thus bank angle is held constant. Notice also (1) a slightly increased pitch attitude, and (2) a slightly increased power (RPM) requirement. Item 1 above means that when an aircraft is banked, lift is lost and will cause a descent. Pulling back on the yoke a slight amount will generate new lift equal to that lost from banking and keep lift = weight. Hence, the pitch will appear nose high. Item 2 is required because the generation of lift produces new drag and is counter-balanced with a slight power increase so thrust = drag.

A left turn and a right turn differ most noticeably in how they appear on the attitude indicator.

Normal turns to a heading have the requirement of completing the turn on a specific heading. A turn is entered with central attention on the ADI, by turning the yoke in the direction of desired turn to increase bank from zero to 30° left (or right). When the bank angle is established the yoke is returned to neutral. The pitch is increased slightly by pulling back on the yoke. When the aircraft is in a banked attitude, pitch information is represented by referencing the miniature aircraft fuselage dot to the center of the horizon line on the sphere. The airspeed will decrease slightly with this increase in pitch. So, the power is increased slightly and crosschecked to prevent this airspeed decrease. When the bank is established and the airspeed is stable, the turn is in a steady state. At this point the crosscheck reverts to a rhythmic scan of all the instruments to monitor performance and detect errors.

Before the desired heading approaches the top index of the heading

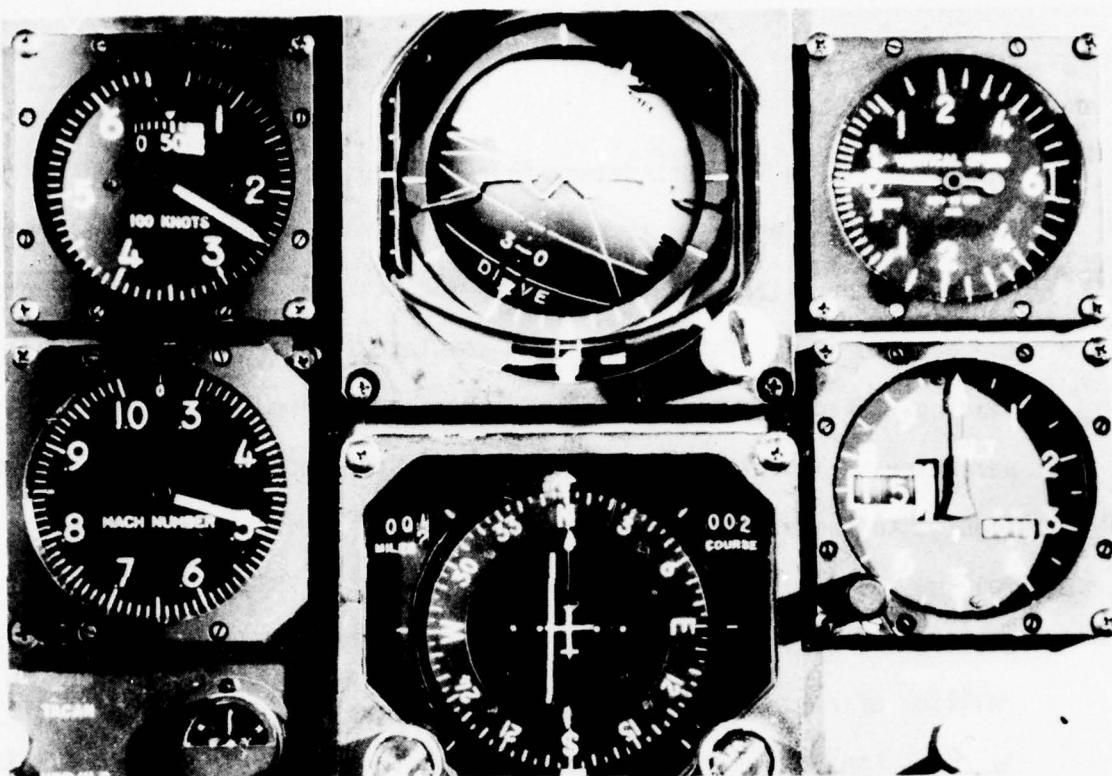


Figure 15. Normal 30° Bank Turn Left

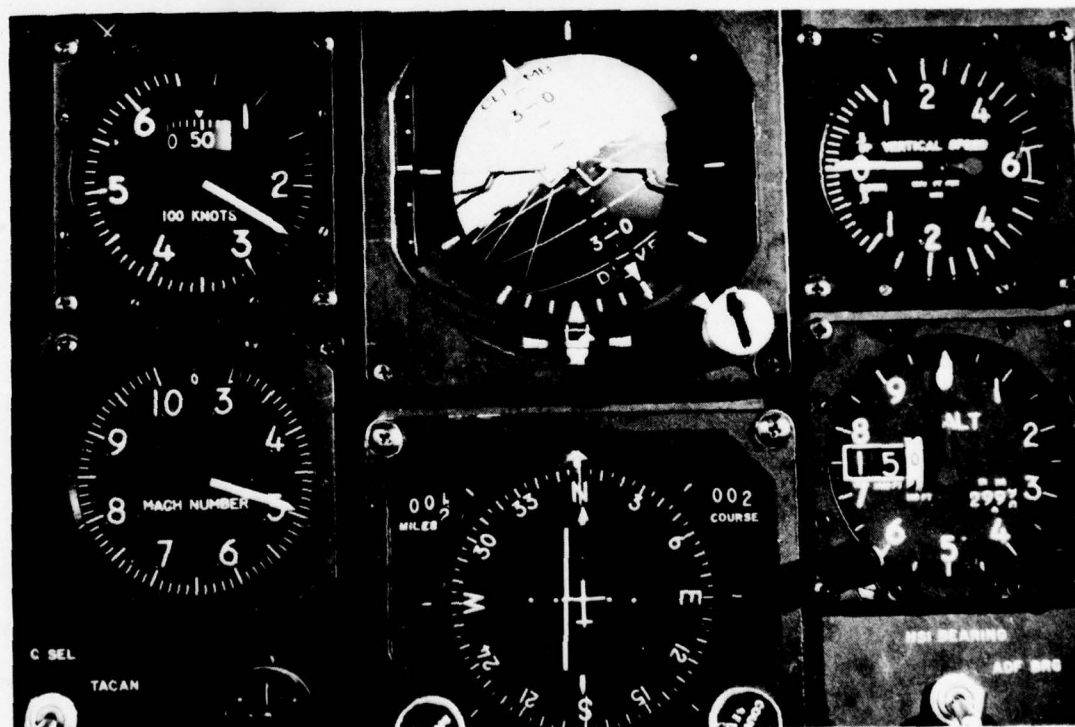


Figure 16. Normal 30° Bank Turn Right

indicator, the pilot must determine a lead point to begin a roll out. Ten degrees of lead is a technique. Ten degrees prior to the desired heading, centralize your attention on the attitude indicator and decrease the bank to zero. This will slowly complete the turn on the desired heading. When the wings are level, scan the instruments for desired parameters. The pitch will have to be lowered back to level and the power reduced to the straight and level setting. The most important aspect of rolling in or out of a turn is a consistent roll rate. Once you've developed a consistent roll rate, you can select your own lead point to roll out of a turn on a heading.

D. Constant Airspeed Climb: A steady state climb is a balanced condition of lift, weight, thrust, and drag where the flight path of the aircraft is upward. Airspeed and heading are constant. Altitude and vertical velocity are variable in the steady state part of the climb.

#### CONSTANT A/S CLIMB

| A/S  | ALT | HDG  | VV    | PITCH   | BANK  | POWER (RPM) |
|------|-----|------|-------|---------|-------|-------------|
| 250K | -   | 360° | CLIMB | NOSE HI | LEVEL | 92% FULL    |
| C    | -   | C    | V     | V       | V     | C           |

Deviations from airspeed are corrected with pitch. Deviations from heading are corrected with bank. Climbs are always made to specific altitudes but for the discussion of the steady state portion of a climb, altitude is not considered. The basic differences in a climb display from a straight and level crosscheck are: (1) a nose high picture on the attitude indicator instead of level (about 4°), (2) a constantly

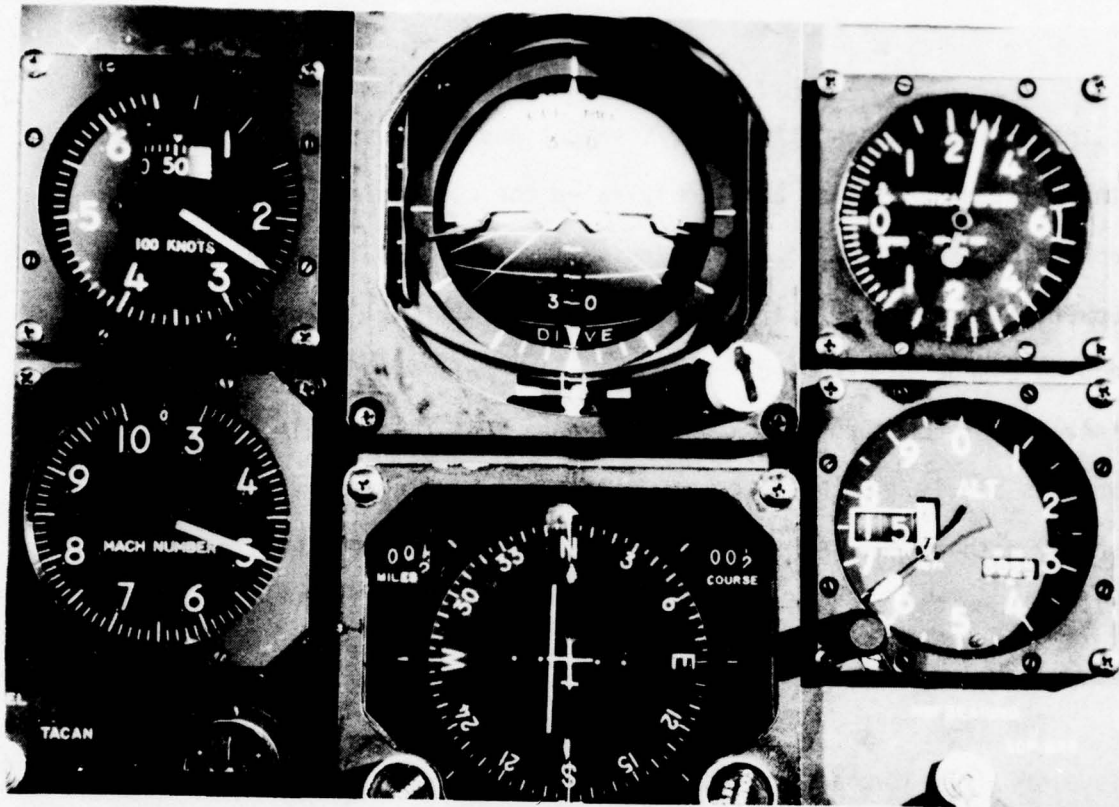


Figure 17. Constant Airspeed Climb

increasing altitude, (3) a climb indication in vertical velocity, and (4) power at 92% instead of the 81.5% recommended at 15,000' for 250K. (Figure 17.)

Since the power is a constant, the only variable for airspeed control is the pitch (i.e., inputs to the control yoke). In straight and level, airspeed is controlled with power as a variable. In a climb (or descent), airspeed is controlled with pitch.

You will be entering a climb from straight and level. Therefore, this portion of the discussion will cover the entry transition to a

climb. With the conditions for straight and level stabilized, look at the attitude indicator and slowly raise the nose to a predetermined approximate pitch while the power is simultaneously increased to full power, crosschecking the airspeed. The goal is full power, nose high, and no change in airspeed. This means the raising of the nose and the increase of power must be accomplished to meet these goals. The secret word is slowly. Once the power reaches full, airspeed is controlled solely with pitch. At this point you have established the steady state climb. Now the crosscheck goes into a scan as the steady climb progresses.

The last part of the climb maneuver is the exit transition, or leveloff. The two considerations here are (1) when to begin the level-off to arrive exactly on the new selected altitude and (2) how to perform the level off.

1. In a steady state climb the vertical velocity is fairly constant at some rate. The level off is begun when the aircraft reaches an altitude below the desired equal 10% of the vertical velocity. For example, if the vertical velocity is fairly constant at 2000 fpm the level off should be started 200 feet prior to the desired level off altitude. As the altitude nears the lead point, begin to place more attention from your scan.

2. The level off is performed in a reverse manner from the entry to the climb. At the selected lead point, the nose is lowered to a level reference on the attitude indicator and the power is simultaneously reduced to the approximate recommended setting for the selected airspeed at the new altitude. When the level off is complete, the aircraft is

back in straight and level flight.

Some of your climbs will be performed without requiring you to determine when to level off. The IP will direct a level off at which time you will perform the mechanics of leveling off. Later on you will be expected to determine when to begin a level off as well as perform it.

E. Constant Airspeed Descent: A steady state descent is a balanced condition of lift, weight, thrust and drag where the flight path of the aircraft is downward. Airspeed and heading are held constant. Altitude and vertical velocity are variable in the steady state part of the descent.

CONSTANT A/S DESCENT

| A/S  | ALT | HDG  | VV      | PITCH    | BANK  | POWER (RPM) |
|------|-----|------|---------|----------|-------|-------------|
| 250K | -   | 360° | DESCENT | NOSE LOW | LEVEL | IDLE        |
| C    | -   | C    | V       | V        | V     | C           |

As in a climb, airspeed is controlled with pitch. The basic differences in a descent display from straight and level crosscheck are: (1) a nose low picture on the attitude indicator, (2) a constantly decreasing altitude, (3) a descent indication on the vertical velocity, and (4) power at idle RPM. See Figure 18.

A descent is entered much in the same manner as a climb except that power is reduced to idle and the nose is lowered to maintain airspeed. The level off considerations are the same as for a climb. Refer to the discussion of a climb.

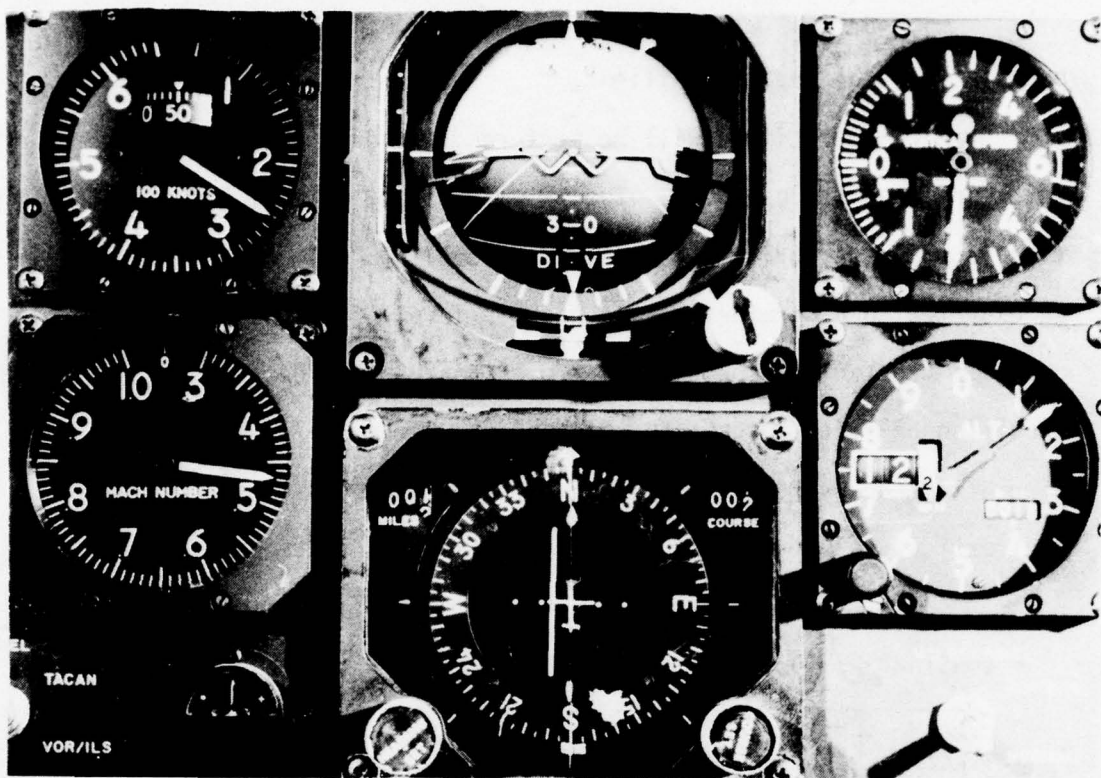


Figure 18. Constant Airspeed Descent

One final consideration is that of trim. An aircraft flying at a constant airspeed requires a specific pitch attitude to maintain a constant altitude. Since the elevator controls the pitch attitude, the yoke is moved forward or aft to keep the pitch attitude appropriate to maintain level flight. Once the position of the elevator to hold level flight is determined, the trim control is used to help hold the position. Trim is actuated by a thumb switch located on the left handle of the yoke. First position the yoke to hold the appropriate pitch attitude. Then monitor attitude indicator for pitch changes as you relax your grip

on the controls. If a change occurs, re-establish the desired pitch and actuate the trim button in the direction you move the controls, i.e., if the pitch lowers as you relax, pull back on the yoke until the pitch is correct and click the trim switch rearward. A similar trim activity is used for aileron trim.

It is important to learn to use trim for smooth and precise aircraft control. The trim button in the T-40 is typical of the kind on most fighter stick grips.

### Pretraining Self-Test

This self-test contains question items to help you test your knowledge of the pretraining guide information. Examine each question and select the most correct answer. The answer is located beneath the hash marks directly below each question.

To use this self-test, cover the answer below the marks, read the question, and make your selection. Then, check the answer against yours. If you selected an incorrect answer, go back and read the applicable section of the pretraining guide.

1. What is the name of the concept used to describe flying by reference to instruments?

- a. Instrument aircraft control.
- b. Attitude instrument flying.
- c. Basic instrument flying.
- d. Pitch, bank, and power control.

//////////

b.

2. What is considered the basic unit of flight?

- a. Pitch attitude.
- b. Constant airspeed.
- c. Bank attitude.
- d. Straight and level flight.

//////////

d.

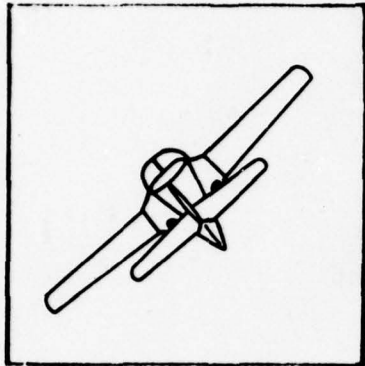
3. Match the instrument with the parameter it displays.

- |                                |                                    |
|--------------------------------|------------------------------------|
| a. Attitude indicator          | _____ RPM in %                     |
| b. Altimeter                   | _____ Speed in knots               |
| c. Airspeed indicator          | _____ Direction in degrees         |
| d. Vertical velocity indicator | _____ Pitch and bank in degrees    |
| e. Heading indicator           | _____ Rate of climb/descent in fpm |
| f. Tachometer                  | _____ Altitude in feet             |

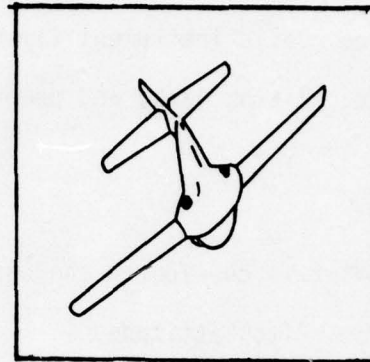
//////////

f, c, e, a, d, b

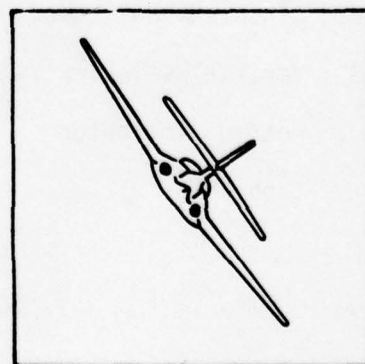
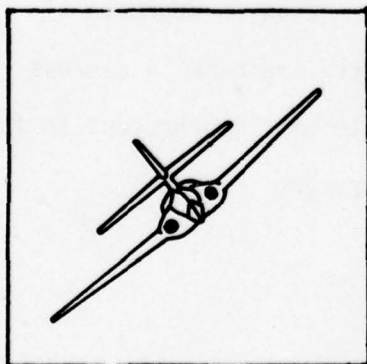
4. Select the answer which most correctly describes the aircraft attitude in each of the displays below.



- a. Straight and level
- b. Left climbing turn
- c. Right climbing turn
- d. Level descent



- a. Straight and level
- b. Left climbing turn
- c. Right descending turn
- d. Left descending turn



- a. Normal left turn
- b. Left descending turn
- c. Straight and level
- d. Level climb

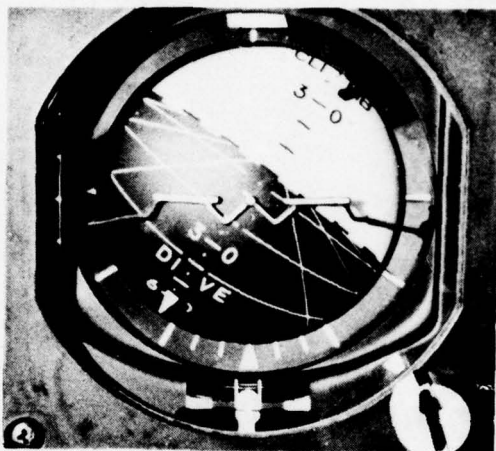
- a. Normal left turn
- b. Steep right turn
- c. Level descent
- d. Level climb

//////////

b, d, a, b

Questions 5-10. Select the correct instrument reading.

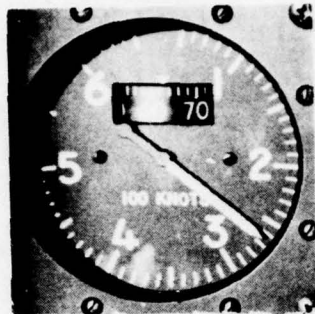
5.



- a. 12° left bank, 5° nose low
- b. 12° right bank, 5° nose low
- c. 40° left bank, 10° nose low
- d. 40° right bank, 10° nose low.

//////////

c.



- a. 160 knots
- b. 260 knots
- c. 162 knots
- d. 262 knots

////////////////

d.

7.



- |           |             |
|-----------|-------------|
| a. 145.3' | c. 14530'   |
| b. 4530'  | d. 145,300' |

////////////////

c.

8.

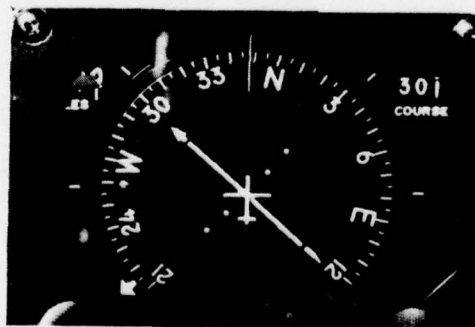


- a. 540 fpm descent.
- b. 540 fpm climb.
- c. 5400 fpm descent.
- d. 5400 fpm climb.

////////////////

c.

9.

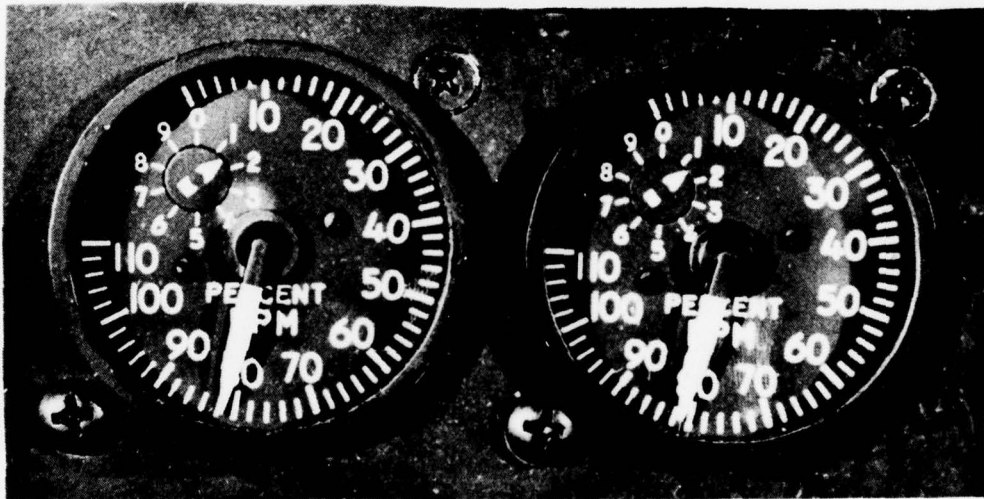


- a. 348°
- b. 303°
- c. 033°
- d. 338°

////////////////

a.

10.



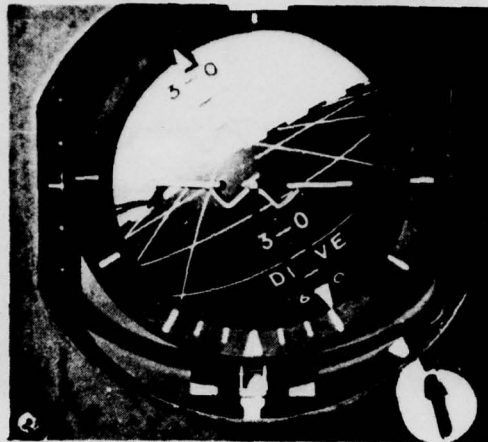
- a. 81%
- b. 81.5%
- c. 91.5%
- d. 50%

////////////////

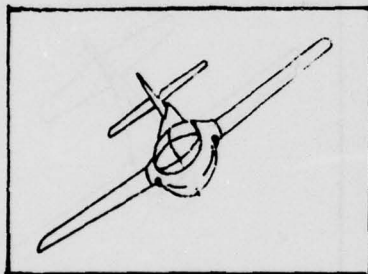
b.

Questions 11-13. Select the aircraft picture which most closely represents the attitude display.

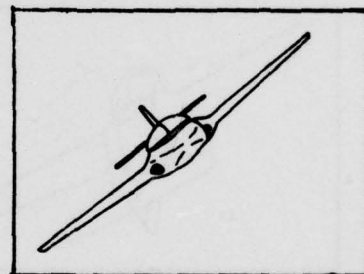
11.



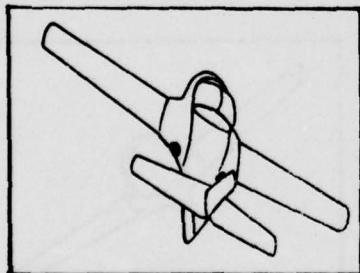
a.



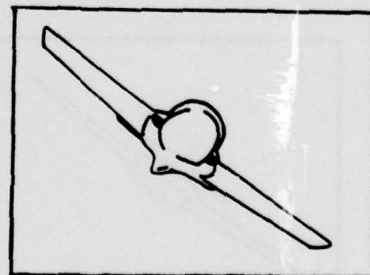
c.



b.



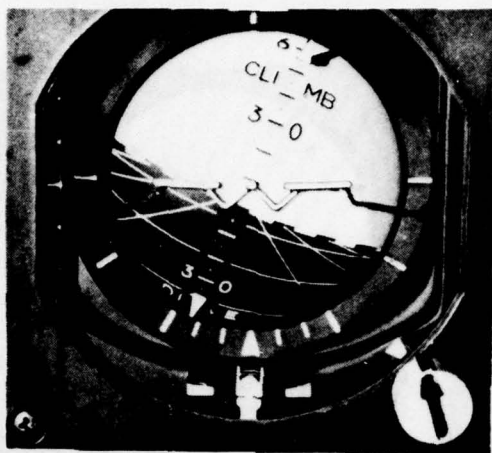
d.



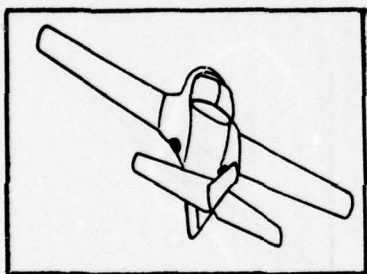
////////////////

a.

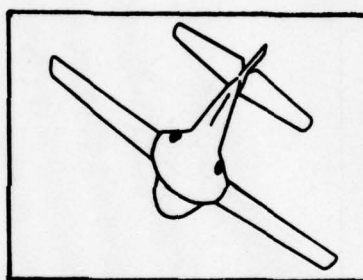
12.



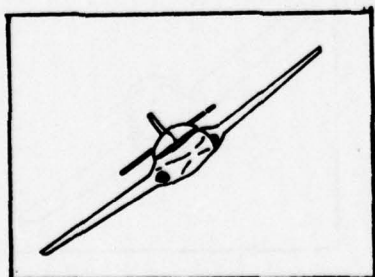
a.



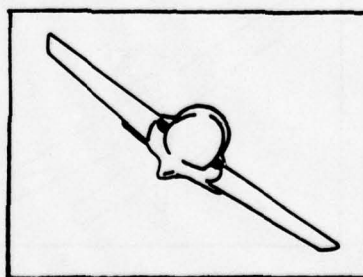
c.



b.



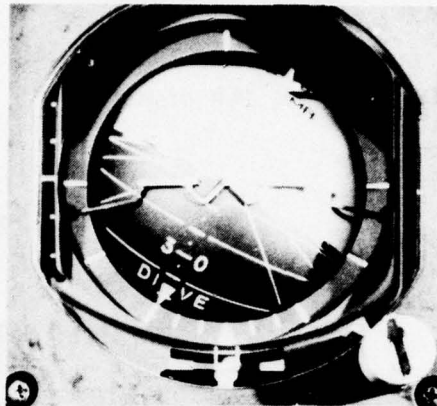
d.



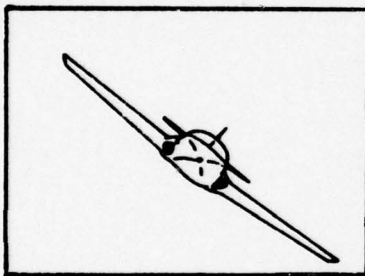
////////////////

d.

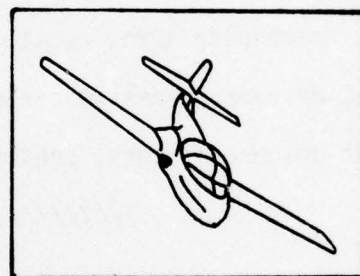
13.



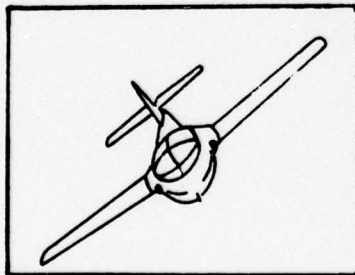
a.



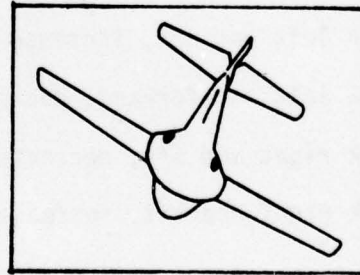
c.



b.



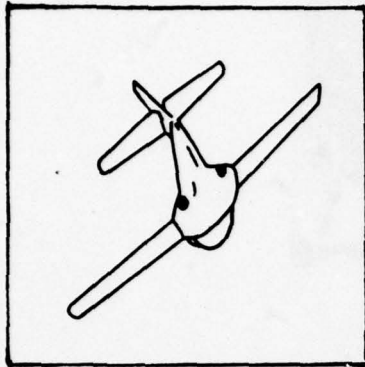
d.



////////////////

a.

14. Which answer most closely describes the display?



Airspeed: 255 knots

RPM: 53%

Vertical Velocity: 5400 fpm

- a. Left climbing turn, constant airspeed.
- b. Left descending turn, constant airspeed.
- c. Level descent, constant airspeed.
- d. Right descending turn, constant airspeed.

////////////////

b.

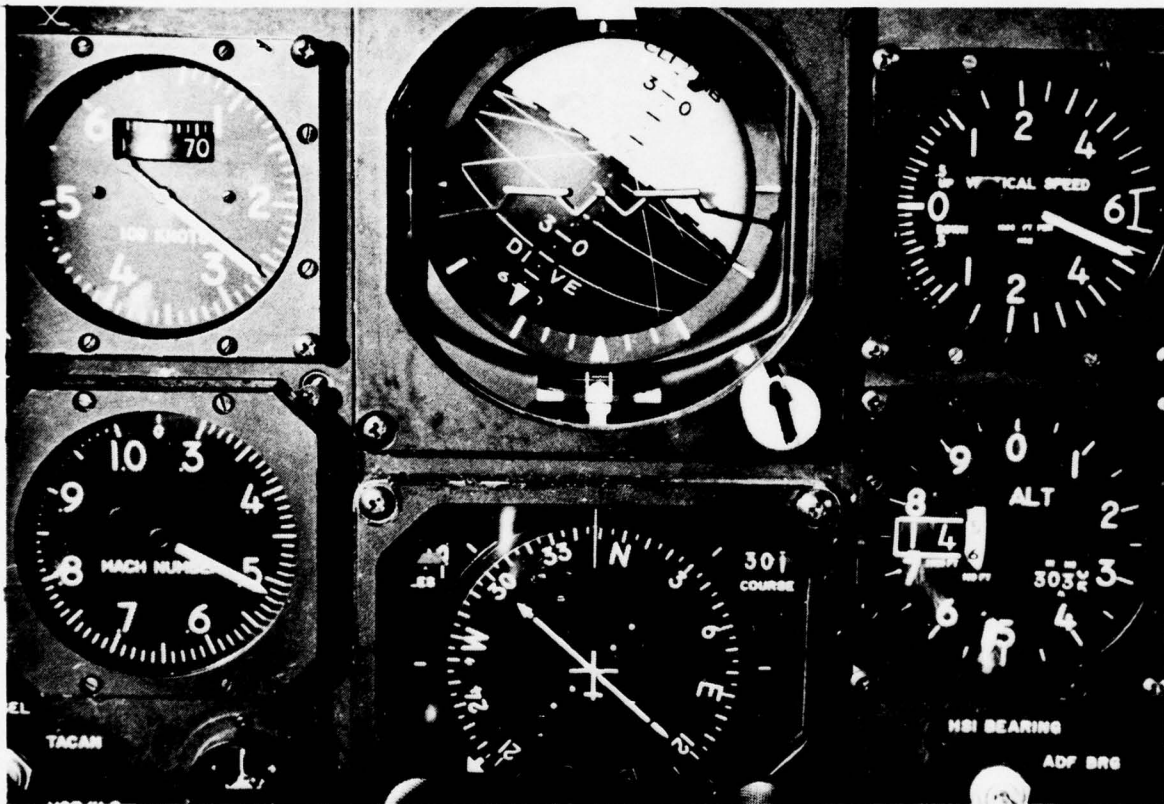
15. What are the control movements to return the aircraft to straight and level flight at a constant airspeed?

- a. Stick left and aft, increase power.
- b. Stick left and forward, decrease power.
- c. Stick right and aft, decrease power.
- d. Stick right and aft, increase power.

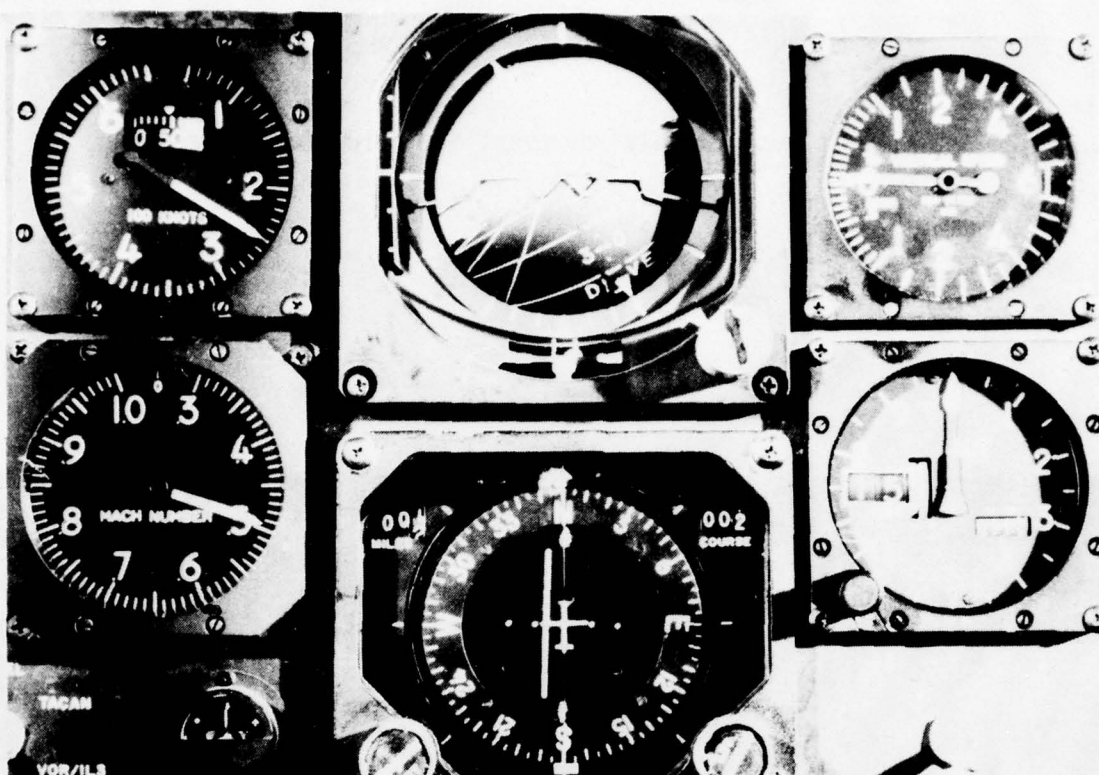
////////////////

d.

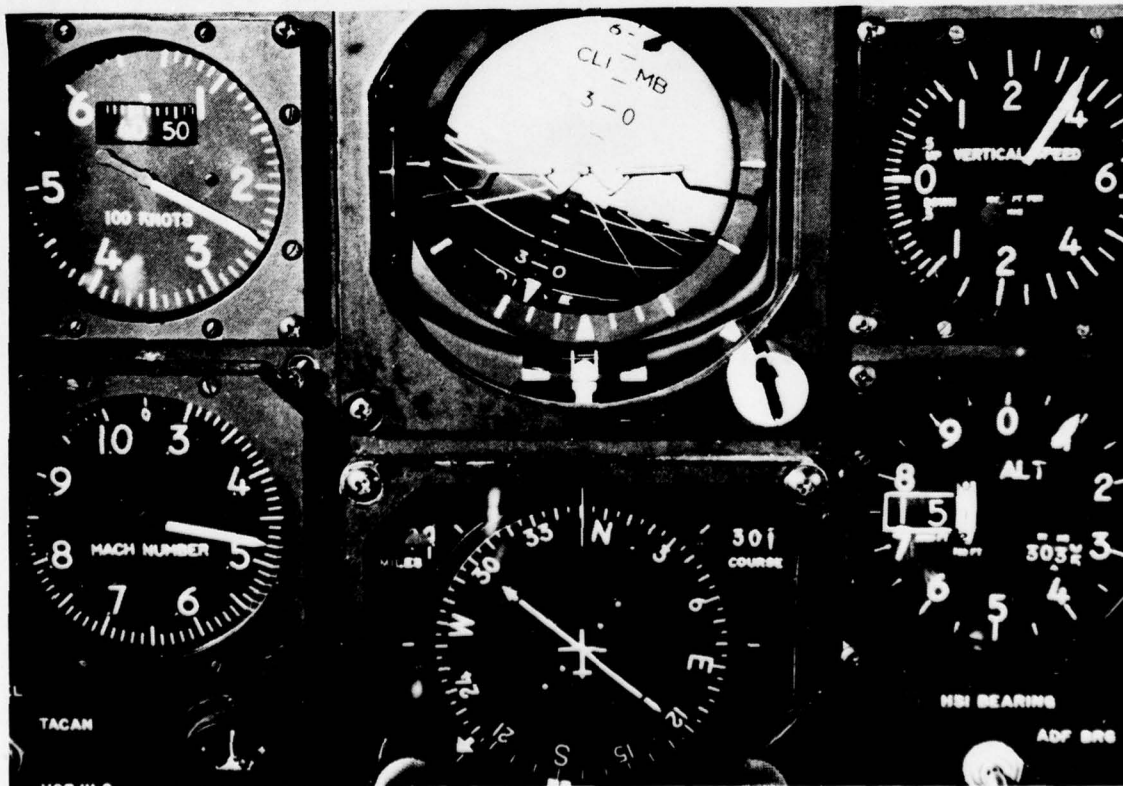
16. Which instruments most closely represent the aircraft in question  
14?



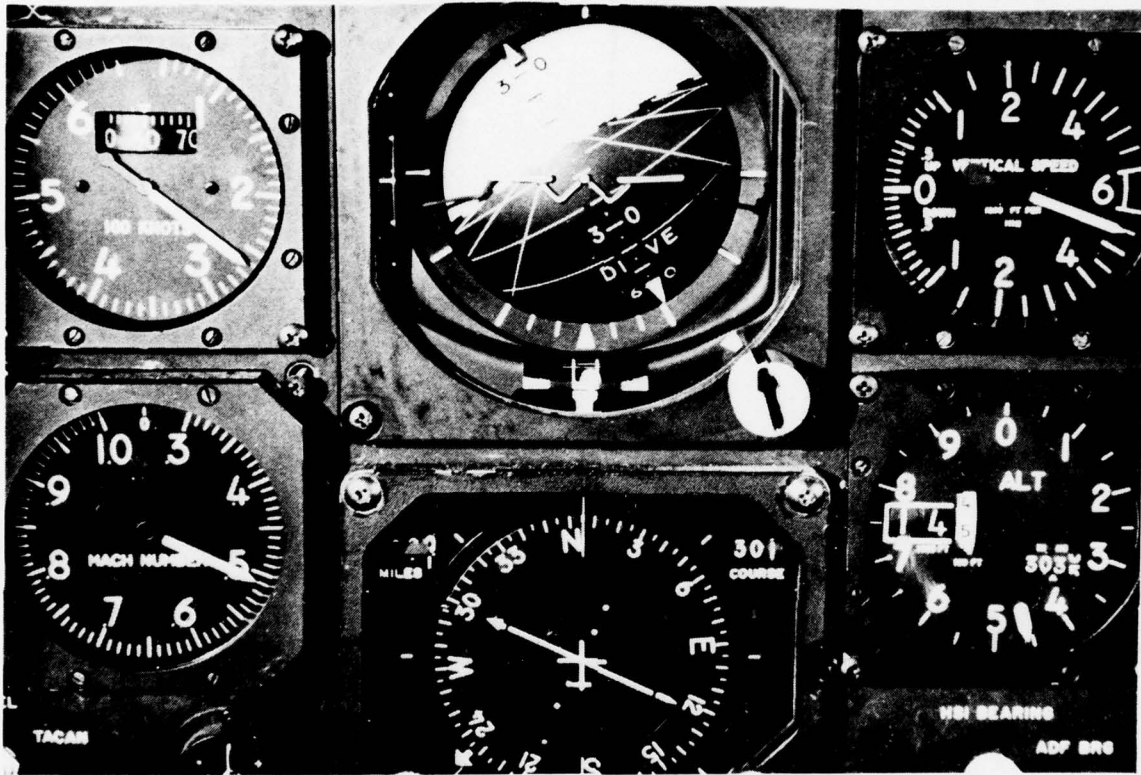
b.



c.



d.

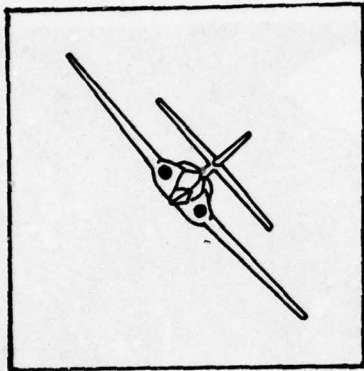


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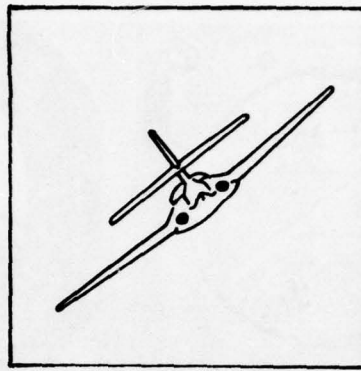
a

17. Which display accurately represents the new attitude from question 15?

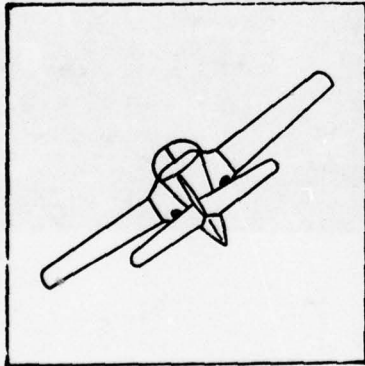
a.



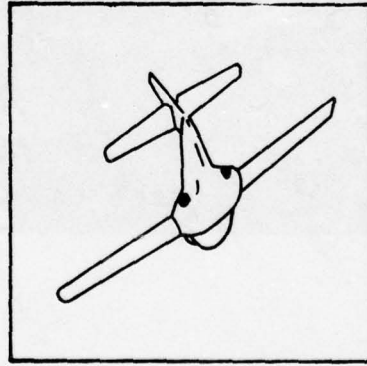
c.



b.



d.



////////////////

None

Questions 18-20. Select the answer which most closely describes the entry procedure (from straight and level flight) for:

18. Normal left turn.

- a. Yoke left to 30° bank, increase pitch slightly, increase power slightly.
- b. Yoke left to 30° bank, maintain pitch, increase power slightly.
- c. Yoke left to 30° bank, maintain pitch, maintain power setting.
- d. Yoke left to 30° bank, maintain pitch, decrease power slightly.

//////////

a.

19. Constant airspeed climb.

- a. Increase pitch to approximately 4°, increase power to maximum simultaneously.
- b. Increase pitch to approximately 4°, increase power to maximum simultaneously at a rate which will maintain a constant airspeed.
- c. Increase power to maximum, then increase pitch to approximately 4°.
- d. Increase pitch to approximately 4°, then increase power to maximum.

//////////

b.

20. Constant airspeed descent.

- a. Decrease pitch to approximately 4°, decrease power to idle simultaneously.
- b. Decrease power to idle, then decrease pitch to approximately 4°.

c. Decrease pitch to approximately  $4^\circ$ , then decrease power to idle.

d. Decrease pitch to approximately  $4^\circ$ , decrease power to idle simultaneously at a rate which will maintain a constant airspeed.

////////////////

d.

### Glossary

LIFT - (L) The upward force in pounds generated by the movement of the wings of an aircraft through the air. Lift opposes weight. When the vertical component of lift ( $L_v$ ) equals weight ( $W$ ), the aircraft is in level flight. Lift can be controlled by the pilot.

WEIGHT - (W) The upward force on the aircraft in pounds acting downward perpendicular to the surface of the earth. Weight is not controllable by the pilot.

DRAG - ( $D_T$ ) The force acting on the aircraft as it moves through the air opposing forward movement. Total drag ( $D_T$ ) is the sum of parasite drag ( $D_p$ ) and induced drag ( $D_i$ ).  $D_p$  is a result of the friction of a moving aircraft surface with the air.  $D_i$  is the force generated by the production of lift. Drag is opposed by thrust. The pilot has limited control over drag.

THRUST - (T) The force generated by the engines propelling the aircraft forward. When thrust is applied to counterbalance drag, the airspeed will be stable. Thrust is controlled by the pilot by moving the throttles.

#### STRAIGHT AND LEVEL FLIGHT -

The balanced condition of airborne flight where  $L = W$  and  $T = D_T$ . The aircraft neither climbs nor descends and maintains a constant airspeed.

PITCH - The angle between longitudinal axis and the horizon measured in degrees. It is controlled by the pilot and measured on the attitude indicator. Pitch is changed by moving the

controls forward or backward. A change in pitch moves the aircraft about the lateral axis of the aircraft.

**BANK -** The angle between lateral axis and the horizon is measured in degrees. It is controlled by the pilot and measured on the attitude indicator. Bank is changed by moving the controls to the left or right. A change in bank moves the aircraft about the longitudinal axis.

**POWER -** The force generated by the engines to produce thrust controlled by the pilot by moving the throttles to increase or decrease RPM. Generally used to control airspeed. Measured in percent RPM and observed on the tachometers.

**LATERAL AXIS -**

The axis from wing tip to wing tip around which the aircraft is pitched up or down by the elevator (yoke forward and aft).

**LONGITUDINAL AXIS -**

The axis from nose to tail around which the aircraft is banked by the ailerons (yoke left or right).

**VERTICAL AXIS -**

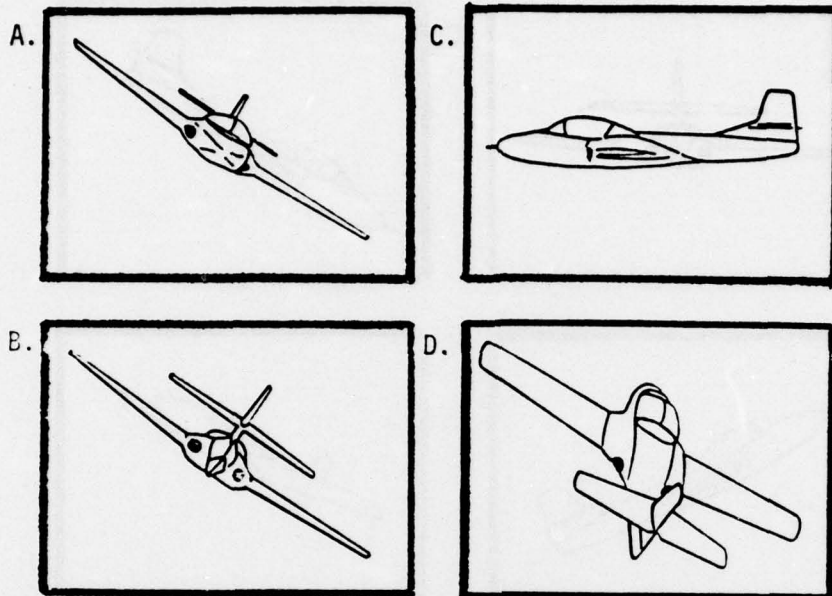
The axis perpendicular to the lateral/longitudinal axis around which the aircraft is yawed using the rudders.

### APPENDIX C: PRETRAINING OBJECTIVES

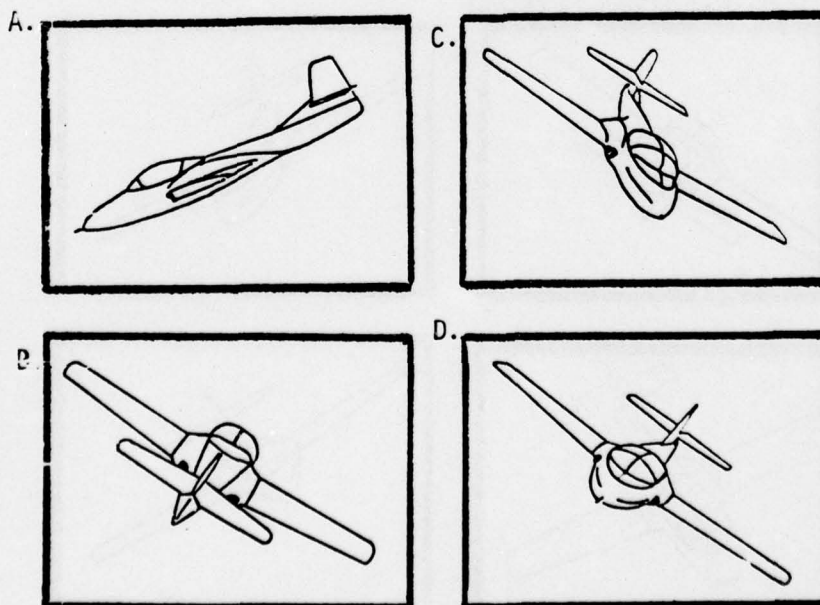
1. Given diagrams of turning aircraft with vectors drawn to indicate forces acting upon the aircraft, identify each diagram as climbing, descending, or maintaining level flight.
2. Given a list of factors affecting aircraft performance during flight, some of which do and do not affect the turning ability of an aircraft, identify those who affect turning ability of the aircraft.
3. Given a list of factors affecting aircraft performance during flight, identify those which cause the aircraft to lose altitude during a turn.
4. Given pictorial representations of each of six T-40 cockpit instruments, i.e., airspeed indicator, vertical velocity indicator, heading indicator, altimeter, attitude indicator and tachometer, in which the displays of each instrument represent specific parameter values, tell what the correct reading for each instrument is, within +5 percent of the true parameter value represented.
5. Given a pictorial representation of the T-40 cockpit instrument panel, identify: (1) the altimeter, (2) the airspeed indicator, (3) vertical velocity indicator, (4) attitude indicator, (4) heading indicator and (5) tachometer.
6. Given a variety of flight parameter values, name the appropriate indicator instrument through which the parameter value will be represented in flight on the instrument panel.
7. Given line illustrations of a T-40 aircraft varying in roll, pitch, and heading, the student will identify the illustration that best represents the position of the aircraft on an illustration of an attitude indicator and a heading indicator.
8. Given a diagram of the T-40 instrument panel and a list of crosscheck procedures, indicate the proper order in which the procedures should occur.
9. Given a diagram of the instrument panel showing indicators in specific value readings, a description of a desired change in a specific parameter, and a list of aircraft control inputs, some of which are and are not appropriate for affecting the desired change, identify the appropriate alternative.

**APPENDIX D: T-40 INSTRUCTIONAL STRATEGIES  
CRITERION MEASUREMENT**

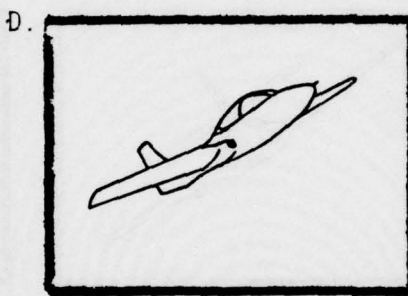
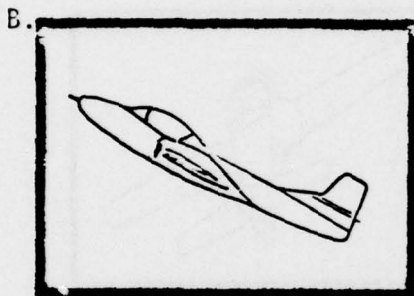
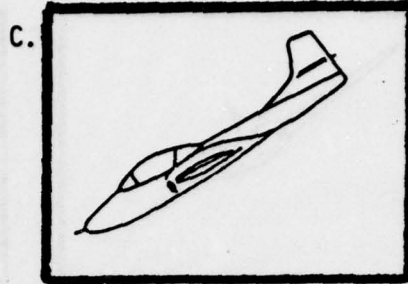
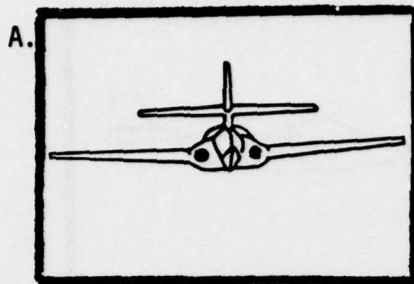
1. WHICH AIRCRAFT IS IN A LEVEL TURN TO THE LEFT?



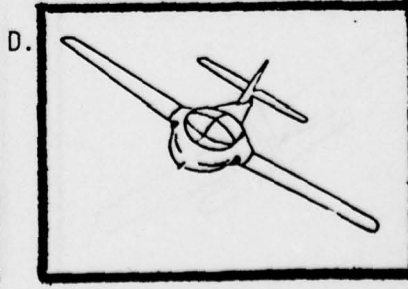
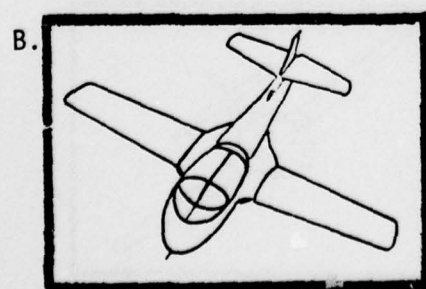
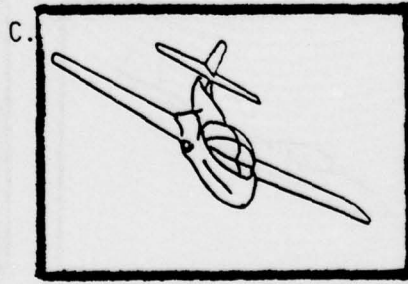
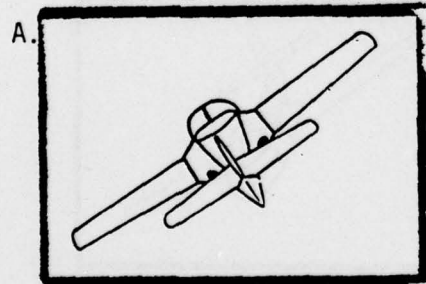
2. WHICH AIRCRAFT IS IN A CLIMB TO THE RIGHT?



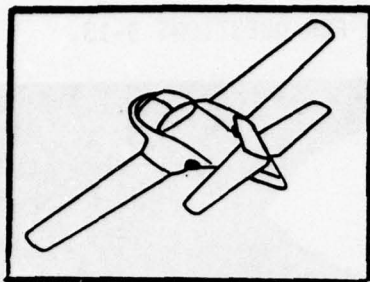
3. WHICH AIRCRAFT IS IN LEVEL FLIGHT?



4. WHICH AIRCRAFT WILL ATTAIN THE GREATEST AIRSPEED WITH A CONSTANT POWER SETTING?



5.



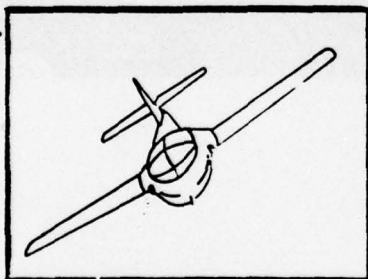
5. WHAT IS THE FLIGHT ATTITUDE OF THIS AIRCRAFT?

- A. LEFT CLIMB.
- B. STRAIGHT AND LEVEL.
- C. SHALLOW LEVEL CLIMB.
- D. RIGHT DESCENT.

6. WHAT ARE THE BASIC CONTROL INPUTS TO RETURN THE AIRCRAFT IN QUESTION 5 TO STRAIGHT AND LEVEL?

- A. YOKE LEFT AND AFT.
- B. YOKE LEFT AND FORWARD.
- C. YOKE RIGHT AND AFT.
- D. YOKE RIGHT AND FORWARD.

7.



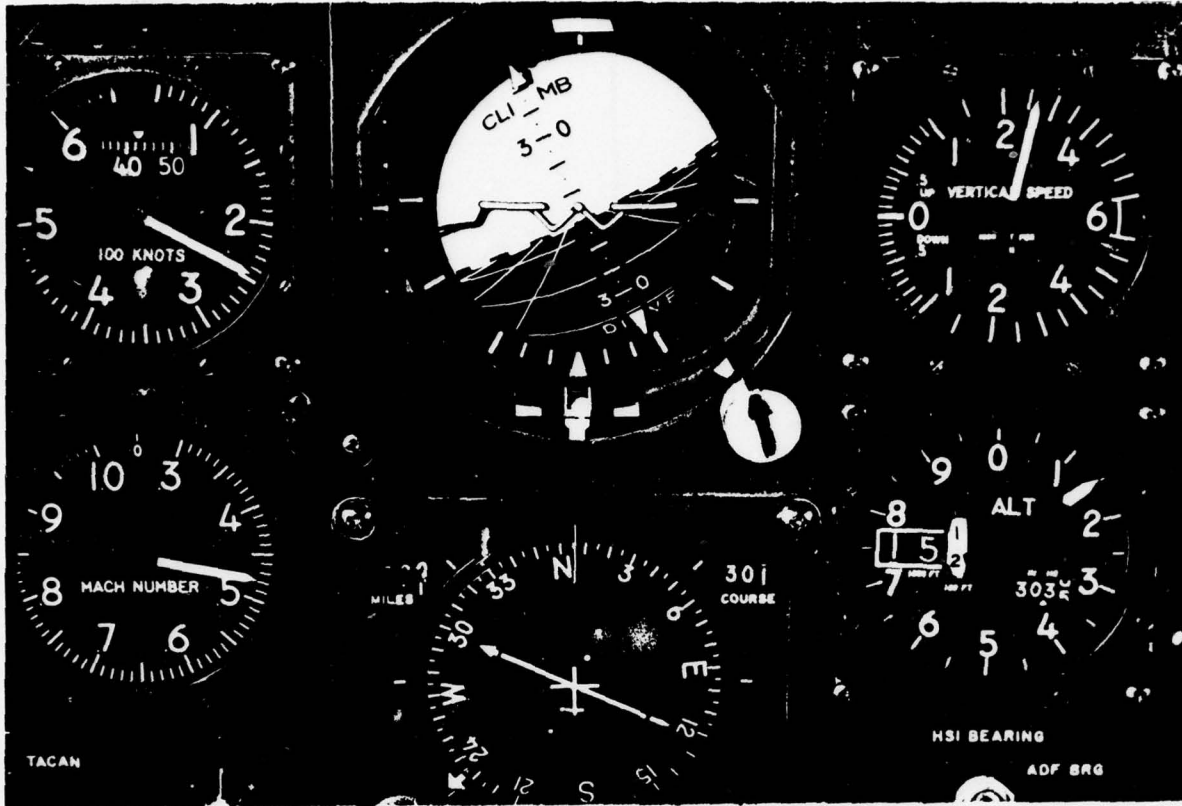
7. WHAT IS THE FLIGHT ATTITUDE OF THIS AIRCRAFT?

- A. LEFT CLIMB.
- B. STRAIGHT AND LEVEL.
- C. SHALLOW LEVEL CLIMB.
- D. RIGHT DESCENT.

8. WHAT ARE THE BASIC CONTROL INPUTS TO RETURN THE AIRCRAFT IN QUESTION 7 TO STRAIGHT AND LEVEL?

- A. YOKE LEFT AND AFT.
- B. YOKE LEFT AND FORWARD.
- C. YOKE RIGHT AND AFT.
- D. YOKE RIGHT AND FORWARD.

REFER TO THE INSTRUMENT PANEL BELOW FOR QUESTIONS 9-13.



9. WHAT IS THE AIRSPEED?
- A. 142 KNOTS.
  - B. 142 MPH.
  - C. 242 KNOTS.
  - D. 242 MPH.
10. WHAT IS THE ALTITUDE?
- A. 5,150'
  - B. 151,500'
  - C. 150'
  - D. 15,150'

11. WHAT IS THE HEADING?

- A. 006°
- B. 366°
- C. 300°
- D. 301°

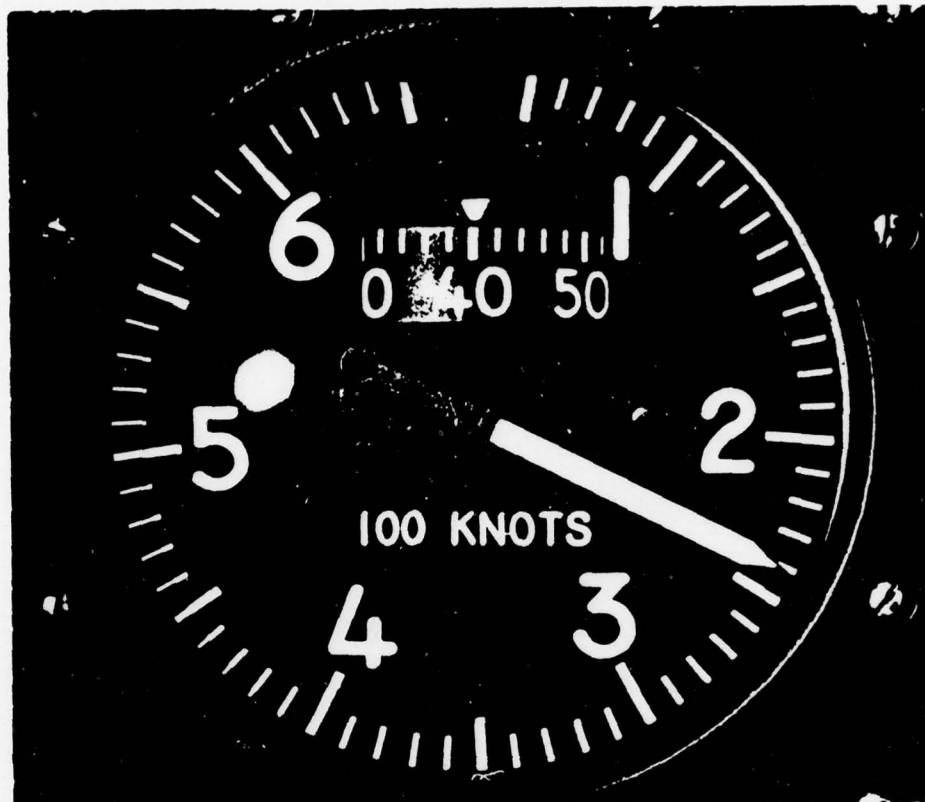
12. WHAT IS THE VERTICAL VELOCITY?

- A. 260 FPM
- B. 260 MPH
- C. 2600 MPH
- D. 2600 FPM

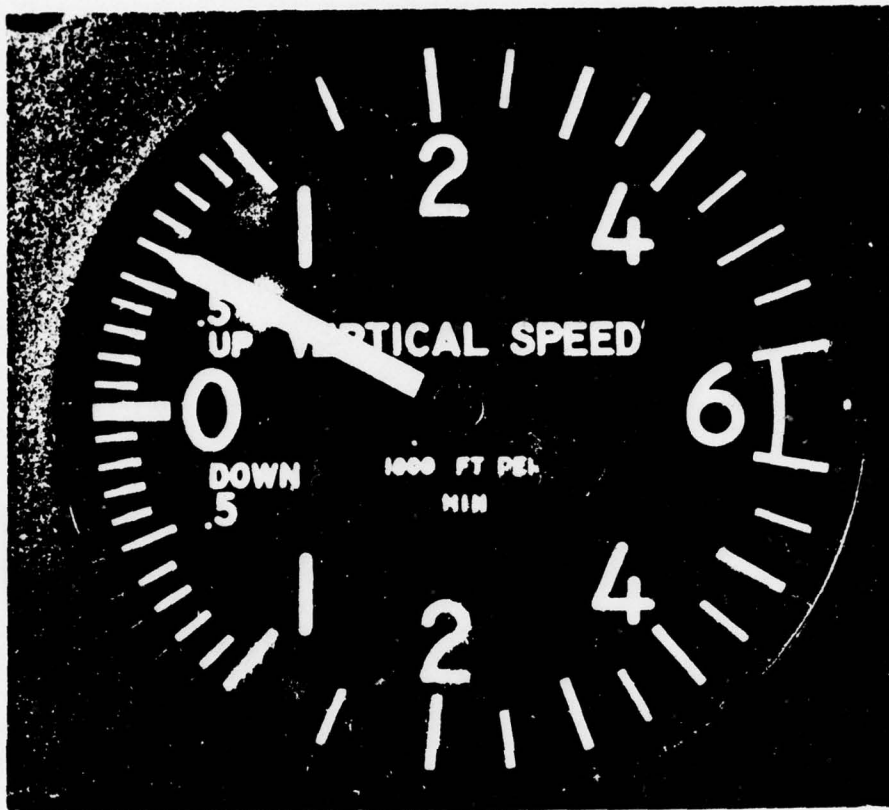
13. WHAT IS THE BANK ATTITUDE?

- A. 28° LEFT.
- B. 5° NOSE HIGH.
- C. 28° RIGHT.
- D. 10° NOSE HIGH.

FOR QUESTIONS 14-17 READ THE INSTRUMENT DISPLAY AND  
SELECT THE ANSWER WHICH BEST DESCRIBES THE CONTROL  
INPUTS TO REGAIN THE DESIRED READING. DO NOT CONSIDER  
THE EFFECT YOUR CHOICE WOULD HAVE ON OTHER INSTRUMENTS.



14. DESIRED READING: 250K
- A. INCREASE RPM ONLY
  - B. INCREASE RPM AND/OR DESCEND
  - C. DECREASE RPM ONLY
  - D. DECREASE RPM AND/OR DESCEND



15. DESIRED READING: ZERO VERTICAL VELOCITY
- A. DECREASE PITCH
  - B. INCREASE RPM
  - C. DECREASE RPM
  - D. INCREASE PITCH

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AIR FORCE HUMAN RESOURCES LAB BROOKS AFB TEX  
INVESTIGATION OF DIAGNOSTIC, ERROR DETECTOR, AND SELF-TAUGHT IN--ETC(U)  
OCT 76 D M TYLER, R W MCFADDEN, E E EDDOWES  
AFHRL-TR-76-65

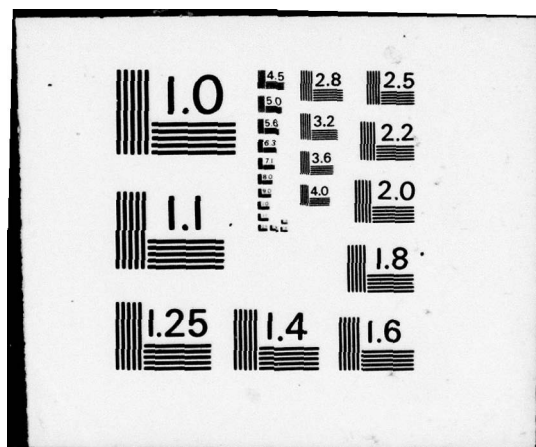
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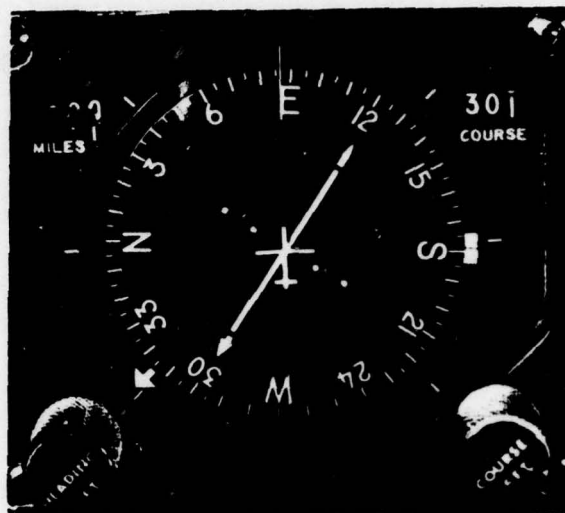
2 of 3  
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16. DESIRED READING: 15,000'
- A. CLIMB APPROXIMATELY 1,170'
  - B. DESCEND APPROXIMATELY 8,830'
  - C. CLIMB APPROXIMATELY 8,830'
  - D. DESCEND APPROXIMATELY 1,170'



17. DESIRED READING: HEADING  $360^{\circ}$
- A. TURN LEFT APPROXIMATELY  $96^{\circ}$
  - B. TURN RIGHT APPROXIMATELY  $86^{\circ}$
  - C. TURN LEFT APPROXIMATELY  $86^{\circ}$
  - D. TURN RIGHT APPROXIMATELY  $230^{\circ}$

18. THE APPROXIMATE PITCH ATTITUDE FOR A CONSTANT AIRSPEED CLIMB

IS \_\_\_\_\_ NOSE HIGH.

- A. 1°
- B. 2°
- C. 3°
- D. 4°

19. WHICH ANSWER BEST DESCRIBES THE ENTRY TO A NORMAL LEFT TURN?

- A. INCREASE PITCH SLIGHTLY, THEN ROLL INTO 30° LEFT BANK ON THE ATTITUDE INDICATOR, INCREASE RPM SLIGHTLY.
- B. INCREASE RPM SLIGHTLY, THEN INCREASE PITCH SLIGHTLY, THEN ROLL INTO 30° LEFT BANK ON THE ATTITUDE INDICATOR.
- C. ROLL INTO 30° LEFT BANK ON THE ATTITUDE INDICATOR, THEN INCREASE PITCH SLIGHTLY, THEN INCREASE RPM SLIGHTLY.
- D. ROLL INTO 30° OF LEFT BANK ON THE HEADING INDICATOR, THEN INCREASE RPM SLIGHTLY, THEN INCREASE PITCH SLIGHTLY.

20. WHICH ANSWER BEST DESCRIBES THE EXIT (ROLLOUT) FROM A NORMAL 30° BANK TURN?

- A. BEGIN ROLLOUT 30° PRIOR TO DESIRED HEADING WITH EMPHASIS ON THE ATTITUDE INDICATOR DURING ROLLOUT.

- B. BEGIN ROLLOUT 30° PRIOR TO DESIRED HEADING WITH EMPHASIS ON THE HEADING INDICATOR DURING ROLLOUT.
  - C. BEGIN ROLLOUT 10° PRIOR TO DESIRED HEADING WITH EMPHASIS ON THE HEADING INDICATOR DURING ROLLOUT.
  - D. BEGIN ROLLOUT 10° PRIOR TO DESIRED HEADING WITH EMPHASIS ON THE ATTITUDE INDICATOR DURING ROLLOUT.
21. WHICH ANSWER BEST DESCRIBES THE ENTRY TO A CONSTANT AIRSPEED CLIMB?
- A. SLOWLY RAISE THE NOSE WHILE SIMULTANEOUSLY INCREASING RPM TO FULL POWER.
  - B. INCREASE RPM TO FULL, THEN RAISE THE NOSE.
  - C. SLOWLY RAISE THE NOSE TO AN APPROXIMATE PITCH, THEN INCREASE RPM TO FULL.
  - D. SLOWLY RAISE THE NOSE WATCHING THE VERTICAL VELOCITY WHILE SIMULTANEOUSLY INCREASING RPM TO FULL.

22. WHICH ANSWER BEST DESCRIBES THE EXIT (LEVEL OFF) FROM A CONSTANT AIRSPEED DESCENT?
- A. BEGIN LEVEL OFF PRIOR TO DESIRED ALTITUDE USING 200' OF LEAD.
  - B. BEGIN LEVEL OFF PRIOR TO DESIRED ALTITUDE USING A LEAD POINT EQUAL TO 10% OF THE VERTICAL VELOCITY.
  - C. BEGIN LEVEL OFF PRIOR TO DESIRED ALTITUDE USING 100' OF LEAD.
  - D. BEGIN LEVEL OFF AT DESIRED ALTITUDE AND CLIMB BACK TO DESIRED IF NECESSARY.
23. IN A CONSTANT AIRSPEED DESCENT ON A HEADING, WHICH PARAMETER IS VARIED AS NECESSARY?
- A. PITCH
  - B. POWER
  - C. HEADING
  - D. AIRSPEED
24. THE RECOMMENDED LEAD POINT FOR ROLLING OUT OF A TURN IS \_\_\_\_\_ AND IS LOCATED ON THE \_\_\_\_\_.
- A.  $10^{\circ}$ ; ATTITUDE INDICATOR
  - B.  $1/3$  THE ANGLE OF BANK; HEADING INDICATOR
  - C.  $1/3$  THE ANGLE OF BANK; ATTITUDE INDICATOR
  - D.  $20^{\circ}$ ; HEADING INDICATOR.

25. THE RECOMMENDED LEAD POINT FOR A LEVEL OFF IS \_\_\_\_\_ AND IS LOCATED ON THE \_\_\_\_\_.
- A. 200'; VERTICAL VELOCITY INDICATOR.
  - B. 10% OF VERTICAL VELOCITY; ATTITUDE INDICATOR.
  - C. 200'; ALTIMETER.
  - D. 10% OF VERTICAL VELOCITY; ALTIMETER
26. IF YOUR ALTITUDE IS 500' BELOW DESIRED, WHAT IS THE RECOMMENDED VERTICAL VELOCITY TO PERFORM A CORRECTION BACK TO DESIRED.
- A. 1000 FPM CLIMB.
  - B. 1000 FPM DESCENT.
  - C. 500 FPM CLIMB.
  - D. 500 FPM DESCENT.
27. THE DESIRED HEADING IS  $090^{\circ}$ . THE ACTUAL HEADING IS  $075^{\circ}$ . TO CORRECT BACK TO DESIRED, TURN \_\_\_\_\_ USING \_\_\_\_\_ BANK.
- A. RIGHT;  $30^{\circ}$ .
  - B. LEFT;  $30^{\circ}$ .
  - C. RIGHT;  $15^{\circ}$
  - D. LEFT;  $15^{\circ}$
28. DEVIATIONS FROM AIRSPEED IN A LEVEL TURN ARE NORMALLY CORRECTED WITH \_\_\_\_\_.
- A. PITCH.
  - B. BANK.
  - C. POWER.
  - D. CROSSCHECK.

29. THE TWO BASIC TYPES OF CROSSCHECK AS EXPLAINED IN THE PRETRAINING GUIDE ARE \_\_\_\_\_ AND \_\_\_\_\_.
- A. RHYTHMIC SCAN; ACCENTUATED.
  - B. CENTRALIZED; RHYTHMIC SCAN.
  - C. CENTRALIZED; PATTERNED.
  - D. ACCENTUATED; PATTERNED.
30. YOUR CROSSCHECK WILL CENTRALIZE WHEN:
- A. IN A STEADY STATE CONDITION.
  - B. IN AN ENTRY TO A MANEUVER.
  - C. CORRECTING FOR A DEVIATION.
  - D. BOTH B AND C.

#### APPENDIX E: T-40 INSTRUCTIONAL STRATEGIES SYLLABUS

### Introduction

The purpose of this study is to investigate the effects of alternative instructional strategies in flight training upon learning and transfer of training under conditions of task loading.

This syllabus is designed to employ the T-40 instrument trainer. Five basic instrument maneuvers will be taught. Each group will apply the strategy specified for the group. The subjects for this study are basically naive to flying (less than 50 hours of light aircraft time). Each will receive instruction in four sorties; the fourth sortie being a 50-minute evaluation. The syllabus will progress the subjects through the sorties by design. There are no proficiency requirements for advancement.

This syllabus provides the direction for each subjects' training including what is to be accomplished and evaluated and the timing used to conduct standardized training. The direction provided is to be used precisely as stated to assure maximum continuity and control.

Syllabus Structure: The syllabus contains four sorties each lasting 50 minutes. A 30-minute pretraining video tape briefing will be given prior to the first sortie. The maneuvers to be taught are:

- A. Straight and level flight.
- B. Normal (30°) turns to a heading - LEFT
- C. Normal (30°) turns to a heading - RIGHT
- D. Constant airspeed climb.
- E. Constant airspeed descents.

The instruction, practice, and testing of these maneuvers is programmed into the syllabus. Attachment 1 shows a breakdown of each sortie by

maneuver.

Data Collection: The data during evaluation will be collected from two areas: the IP using a paper form and the Automated Data Acquisition and Control System (ADACS) computer. The master control for ADACS recording is in the trainer along with heading reset. The switch settings one through five correspond to maneuvers A through E respectively.

Trainer Reset: The trainer will be reset by the IP as directed by the syllabus. Heading and altitude have instant reset features. The airspeed does not. Airspeed must be regained by flying the trainer to 250K and actuating problem freeze. Once on freeze, the heading and altitude can be instantly reset with buttons in the cockpit.

Throttle Adjustment: Full throttle position has been set at 92% at 15,000'. This will be the setting obtained when the throttles are moved full forward. This was done to keep the climb rate in a constant airspeed climb from being excessive.

Timing: The times listed in the enclosed right column represent elapsed time from the start of the sortie. These should be adhered to as closely as possible. The syllabus directs the IP to start the clock at the beginning of each sortie. These elapsed times mark the end of a segment in most cases. However, in some cases, they act as start times; i.e., when the subject is practicing on his own with direction given from outside the trainer. Since each sortie will begin on the hour and lasts only 50 minutes of each hour, there is ten minutes of slack time in which to "catch up."

GROUP I

| Sortie   | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       | Timing<br>(Approx) |
|--|--------------------------------------|----------|----------|-------|--------------------|
|  | Heading                              | Altitude | Airspeed | RPM   |                    |
| I-1  | 360°                                 | 15M      | 250K     | 81.5% |                    |
| <p><u>Objective:</u> The subject will receive diagnostic instruction on the practice maneuvers A, B, C, preceded by a skill test. The subject will be given an evaluation on maneuvers A, B, C, at the end of the sortie.</p> <p><u>Subject Activity:</u></p> <ol style="list-style-type: none"> <li>1. Adjust seat</li> <li>2. Put on headset</li> </ol> <p><u>Instructor Activity:</u></p> <ol style="list-style-type: none"> <li>1. Adjust seat to normal position</li> <li>2. Put on head set - Comm check</li> <li>3. Check               <ol style="list-style-type: none"> <li>a. Door closed</li> <li>b. Initial conditions set</li> <li>c. ADACS - on position 1. Stop</li> <li>d. Rudder &amp; Aileron trim - neutral</li> <li>e. Motion - On</li> </ol> </li> </ol> |                                      |          |          |       | (02:00)            |
| WHEN READY - START CLOCK - ADACS START - UNFREEZE  |                                      |          |          |       | 00:00              |
| Skill Test   | 05:00                                | 360°     | 15M      | 250K  | 81.5%              |
| <p><u>Subject Activity:</u> Perform straight and level flight for 05:00 starting from a frozen state of initial conditions.</p> <p><u>Instructor Activity:</u> Monitor only (no instruction) while subject flies straight and level. At the end of 05:00 elapsed time:</p>   |                                      |          |          |       |                    |

ADACS - STOP

05:00

ASSUME CONTROL & RESET TO INITIAL  
CONDITIONS.

|         |       |      |     |      |       |
|---------|-------|------|-----|------|-------|
| A. ST&L | 04:00 | 360° | 15M | 250K | 81.5% |
|---------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while  
receiving instruction.

Instructor Activity: Instruct straight and level flight.

Discuss:

- a. Bar width pitch control.
- b. Correction procedures for altitude  
deviation and instruments used.
- c. Bank control.
- d. Correction procedure for heading  
deviation and instruments used.
- e. Power control.
- f. Correction procedures for airspeed  
deviation and instruments used.
- g. Crosscheck pattern for straight  
and level flight.
- h. Trim.

Complete your instruction by 09:00 elapsed.

GO ON TO NEXT SEGMENT.

09:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                       |       |      |     |      |       |
|-----------------------|-------|------|-----|------|-------|
| B & C. 30° Bank Turns | 03:00 | 360° | 15M | 250K | 81.5% |
|-----------------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct 30° bank turns in both directions. Direct the roll in and roll out without regard for heading. Discuss:

- a. Centralized crosscheck for roll in; specifically, where to look.
- b. How to move the controls for roll in.
- c. What the attitude picture should be for a 30° bank turn.
- d. Extra back pressure required.
- e. Power control - approx 83% in the turn.
- f. Rhythmic crosscheck in steady state.
- g. How to correct for deviations.
- h. Centralized crosscheck for roll out.
- i. How to move the controls for roll out.
- j. Crosscheck when straight and level.

Complete your instruction by 12:00 elapsed.

GO ON TO NEXT SEGMENT.

12:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                                     |       |      |     |      |       |
|-------------------------------------|-------|------|-----|------|-------|
| 30° Bank Turns<br>B & C. to Heading | 03:00 | 360° | 15M | 250K | 81.5% |
|-------------------------------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct 30° bank turns to a heading in both directions. Select a heading for the subject to turn to. Discuss:

- a. The use of the attitude indicator to determine a lead point (1/3 angle of bank).
- b. The emphasis on the heading indicator as it nears the lead point.
- c. The centralized crosscheck for roll out at the lead point.

Complete your instruction by 15:00 elapsed.

GO ON TO NEXT SEGMENT.

15:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                   |       |      |     |      |       |
|-------------------|-------|------|-----|------|-------|
| Practice A, B, C. | 20:00 | 360° | 15M | 250K | 81.5% |
|-------------------|-------|------|-----|------|-------|

Subject Activity: Practice maneuvers A, B, C, as directed by the IP while receiving error analysis.

Instructor Activity: Direct the practice of maneuvers A, B, C, while making error analysis. Discuss:

- a. Why deviations occurred.
- b. How to correct back to desired flight conditions.

c. Importance of an organized crosscheck.

Timing Control: Divide the maneuvers into the following segments. At the elapsed time go on to the next maneuver.

**NOTE**

DO NOT START A SEGMENT  
BEFORE THE STATED TIME

|   |       | <u>ELAPSED</u> |
|---|-------|----------------|
| A. Straight & Level for:                | 06:00 | 21:00          |
| B. 30° bank turns left to heading for:  | 07:00 | 28:00          |
| C. 30° Bank turns right to heading for: | 07:00 | 35:00          |

Turns of: 90° takes 1 minute

180° takes 1 min 50 sec

360° takes 3 min 20 sec

Complete the practice segment at 35:00 elapsed and prepare for evaluation.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

FREEZE TRAINER.

35:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 15:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- Straight and level.
- Normal turn left to a heading.
- Normal turn right to a heading.

Refer to evaluation sheet.

EVALUATION SHEET - INSTRUCTIONS - SORTIE 1

|  | Elapsed |
|--|---------|
| Reset clock to 00:00 elapsed   |         |
| Set:   |         |
| ADACS - Position 1. Stop   |         |
| Direct:  |         |
| "Perform straight and level flight heading 360° at 15,000' and 250 knots." |         |
| START CLOCK  | 00:00   |
| START ADACS  |         |
| UNFREEZE - Refer to Attachment 2 for grading.                              |         |
| Record characteristic performance: A                                       |         |
| ADACS - Stop Change to Position 2.   | 04:00   |
| Assume control and reset to initial conditions.                            |         |
| Freeze Trainer   |         |
| Direct:  | 04:30   |
| "Fly straight and level"   |         |
| UNFREEZE -(subject will fly ST&L for approximately 30 sec)                 |         |
| ADACS - Start  | 05:00   |
| Direct:  |         |
| "Turn left to 270° using 30° of bank.                                      |         |
| Maintain altitude and airspeed."   |         |
| Record Characteristic performance: B <sub>1</sub>                          |         |
| ADACS - Stop Remain on Position 2.   | 06:30   |
| Assume control and reset to initial conditions                             |         |
| Freeze Trainer   |         |
| Direct:  | 07:00   |
| "Fly straight and level."  |         |
| UNFREEZE (ST&L for approximately 30 sec)                                   |         |
| ADACS - Start  | 07:30   |
| Direct:  |         |
| "Turn left to 270° using 30° of bank.                                      |         |
| Maintain altitude and airspeed."   |         |
| Record characteristic performance: B <sub>2</sub>                          |         |

|  |       |
|--|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."   | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 10:00 |
| Direct:<br>"Turn Right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                  |       |
| Record characteristic performance: C <sub>1</sub>  |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 11:30 |
| Direct:<br>"Fly straight and level."   | 12:00 |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 12:30 |
| Direct:<br>"Turn right to 180° using 30° of bank.<br>Maintain altitude and airspeed."                  |       |
| Record characteristic performance: C <sub>2</sub>  |       |
| ADACS - Stop Change to Position 1.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 15:00 |
| EGRESS   |       |

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       |
|--------|--------------------------------------|----------|----------|-------|
|        | Heading                              | Altitude | Airspeed | RPM   |
| I-2    | 360°                                 | 15M      | 250K     | 81.5% |

Objective: The subject will receive diagnostic instruction on maneuvers D, E and practice maneuvers A, B, C, D, E. The subject will be given an evaluation on all maneuvers at the end of the sortie.

Subject Activity:

1. Adjust seat
2. Put on headset

Instructor Activity:

1. Adjust seat to normal position
2. Put on headset - Comm check
3. Check
  - a. Door closed.
  - b. Initial conditions set.
  - c. ADACS - STOP
  - d. Rudder and aileron trim - neutral.
  - e. Motion - On

(02:00)

WHEN READY - START CLOCK - UNFREEZE

00:00

|                  |       |      |     |      |       |
|------------------|-------|------|-----|------|-------|
| Practice A, B, C | 05:00 | 360° | 15M | 250K | 81.5% |
|------------------|-------|------|-----|------|-------|

Subject Activity: Warm up with practice on maneuvers A, B, C, as directed by the IP while receiving error analysis.

Instructor Activity: Direct the practice of maneuvers A, B, C, while making error analysis. Discuss:

- a. Why deviations occurred.

b. How to correct back to desired flight conditions.

c. Organization of the crosscheck.

Timing Control: Divide the maneuvers into the following segments. At the elapsed time go on to the next maneuver.

**NOTE**

DO NOT START A SEGMENT  
BEFORE THE STATED TIME.

|   |       |       |
|---|-------|-------|
| A. Straight and level for:              | 02:00 | 02:00 |
| B. 30° bank turns left to heading for:  | 01:30 | 03:30 |
| C. 30° bank turns right to heading for: | 01:30 | 05:00 |

Complete the practice segment at 05:00 elapsed.

GO ON TO NEXT SEGMENT.

05:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                 |       |      |     |      |       |
|-----------------|-------|------|-----|------|-------|
| Climbs          |       |      |     |      |       |
| D & E. Descents | 10:00 | 360° | 15M | 250K | 81.5% |

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct constant airspeed climbs and descents. Discuss:

Climb:

- a. Entering from stable conditions.
- b. Throttles to max with back pressure to approximate pitch attitude (3° nose hi).
- c. Crosschecking airspeed and attitude.

- d. Crosscheck in a steady state climb.
- e. Calculation of lead point (VVI approx 2500 fpm).
- f. Locating lead point (altimeter).
- g. Crosscheck for leveloff (airspeed and attitude).
- h. Throttles to approximate RPM with forward pressure on yoke to level flight pitch attitude.
- i. Crosscheck when back in straight and level flight.

Descent:

- a. Entering from stable conditions.
- b. Throttles to idle with forward pressure to approximate pitch attitude (3° nose lo).
- c. Crosschecking airspeed and attitude.
- d. Crosscheck in steady state descent.
- e. Calculation of lead point (VVI approx 2100 fpm).
- f. Locating lead point (altimeter).
- g. Crosscheck for level off (airspeed and attitude).
- h. Throttles to approximate RPM with back pressure to level flight pitch attitude.

- i. Crosscheck when back in straight and level flight.

Timing Control and Restrictions: Direct the climbs and descents for 2000' altitude change. Allow two minutes for each. This allows time for leveloff and straight and level. Level flight at 17M takes 82%, 13M takes 80.5%. Alternate climbs and descents so that the trainer remains +2000' from 15M.

Complete your instruction by 15:00 elapsed.

GO ON TO NEXT SEGMENT

15:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|              |       |      |     |      |       |
|--------------|-------|------|-----|------|-------|
| Practice A-E | 15:00 | 360° | 15M | 250K | 81.5% |
|--------------|-------|------|-----|------|-------|

Subject Activity: Practice maneuvers A through E as directed by the IP while receiving error analysis.

Instructor Activity: Direct the practice of maneuvers A through E while making error analysis. Discuss:

- Why deviations occurred.
- How to correct back to desired flight conditions.
- Crosscheck. Re-emphasize the difference between the centralized cross-check of entry and exit transitions and the rhythmic crosscheck scan in a steady state.

Timing Control: Divide the maneuvers into the following segments. At the elapsed time go on to the next maneuver.

**NOTE**

DO NOT START A SEGMENT  
BEFORE THE STATED TIME

|                                     |       |       |
|-------------------------------------|-------|-------|
| A. Straight & level flight          | 02:00 | 17:00 |
| B. Two 30° bank turns left          |       |       |
| 1. 360° to 270°; roll out to ST&L   | 01:30 | 18:30 |
| 2. 270° to 180°; roll out to ST&L   | 01:30 | 20:00 |
| C. Two 30° bank turns right         |       |       |
| 1. 180° to 270°; roll out to ST&L   | 01:30 | 21:30 |
| 2. 270° to 360°; roll out to ST&L   | 01:30 | 23:00 |
| D. E. Alternating constant airspeed |       |       |
| Climbs and descents:                |       |       |
| 1. Climb 15M to 17M; level off      | 02:00 | 25:00 |
| 2. Descent 17M to 15M; level off    | 02:00 | 27:00 |
| 3. Climb 15M to 19M; level off      | 03:00 | 30:00 |

(19M requires about 83% RPM)

Complete practice segment at 30:00 elapsed and prepare for evaluation.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

FREEZE TRAINER.

30:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 20:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

A. Straight and level flight

- B. Normal turn left to a heading.
- C. Normal turn right to a heading.
- D. Constant airspeed climbs.
- E. Constant airspeed descents.

Refer to evaluation sheet.

# EVALUATION SHEET - INSTRUCTIONS - SORTIE 2/3

|   |         |
|---|---------|
| Reset clock to 00:00 elapsed  | Elapsed |
| Set:  |         |
| ADACS - Position 1. Stop  |         |
| Direct:   |         |
| "Perform straight and level flight heading 360°<br>at 15,000' and 250 knots." |         |
| START CLOCK   | 00:00   |
| START ADACS   |         |
| UNFREEZE - refer to Attachment 2 for grading                                  |         |
| Record characteristic performance: A  |         |
| ADACS - Stop Change to Position 2.  | 04:00   |
| Assume control and reset to initial conditions                                |         |
| Freeze Trainer  |         |
| Direct:   | 04:30   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 05:00   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>1</sub>                             |         |
| ADACS - Stop Remain on Position 2   | 06:30   |
| Assume control and reset to initial conditions.                               |         |
| Freeze Trainer  |         |
| Direct:   | 07:00   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 07:30   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>2</sub>                             |         |

|   |       |
|---|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions.<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."  | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)   |       |
| ADACS - Start   | 10:00 |
| Direct:<br>"Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                   |       |
| Record characteristic performanc: C <sub>1</sub>  |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 11:30 |
| Direct:<br>"Fly straight and level."  | 12:00 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS-- Start   | 12:30 |
| Direct:<br>"Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."                      |       |
| Record characteristic performance: C <sub>2</sub>   |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 14:00 |
| Direct:<br>"Fly straight and level."  | 14:30 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 15:00 |
| Direct:<br>"Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."                      |       |
| Record characteristic performance: D  |       |

ADACS - Stop Change to Position 5 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to position 1. 20:00  
Assume control and reset to initial conditions  
Freeze Trainer

EGRESS Trainer

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       | Timing<br>(Approx) |
|--------|--------------------------------------|----------|----------|-------|--------------------|
| I-3    | Heading                              | Altitude | Airspeed | RPM   |                    |
|        | 360°                                 | 15M      | 250K     | 81.5% |                    |

Objective: The subject will receive final diagnostic instruction on all maneuvers and practice all maneuvers. The subject will be given an evaluation on all maneuvers at the end of the sortie.

Subject Activity:

1. Adjust seat
2. Put on headset

Instructor Activity:

1. Adjust seat to normal position
2. Put on headset - Comm check
3. Check
  - a. Door closed
  - b. Initial conditions - Set
  - c. ADACS - Stop
  - d. Rudder and aileron trim - neutral
  - e. Motion - on

(02:00)

WHEN READY - START CLOCK - UNFREEZE

00:00

|               |       |      |     |      |       |
|---------------|-------|------|-----|------|-------|
| Maneuvers A-E | 05:00 | 360° | 15M | 250K | 81.5% |
|---------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: This is the last segment of instruction you will be giving to the subject. From straight and level:

1. Direct a left turn to 300°
2. Direct a right turn to 360°
3. Direct a climb to 17M with level off
4. Direct a descent to 15M with level off
5. Maintain straight and level until 05:00

Special Instructions: Pause after each maneuver only long enough to stabilize the parameters. Go on to the next maneuver as soon as stabilized. The purpose of this instructional segment is to give a final refresher to the subject. Complete instruction at 05:00 elapsed.

GO ON TO NEXT SEGMENT.

05:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|               |       |      |     |      |       |
|---------------|-------|------|-----|------|-------|
| Practice A-E. | 25:00 | 360° | 15M | 250K | 81.5% |
|---------------|-------|------|-----|------|-------|

Subject Activity: Practice maneuvers A-E as directed by the IP while receiving error analysis.

Instructor Activity: Direct the practice of maneuvers A-E while making error analysis. Discuss:

- a. Why deviations occurred.
- b. How to correct back to desired (as necessary).
- c. Crosscheck

Timing Control:

|   |       |       |
|---|-------|-------|
| A. Straight and level for:                              | 03:00 | 08:00 |
| B. Three 30° bank turns left:                           |       |       |
| 1. 360° to 270°; roll out to ST&L                       | 01:30 | 09:30 |
| 2. 270° to 180°; roll out to ST&L                       | 01:30 | 11:00 |
| 3. 180° to 360°; roll out to ST&L                       | 02:00 | 13:00 |
| C. Three 30° bank turns right:                          |       |       |
| 1. 360° to 090°; roll out ST&L                          | 01:30 | 14:30 |
| 2. 090° to 180°; roll out ST&L                          | 01:30 | 16:00 |
| 3. 180° to 360°; roll out ST&L                          | 02:00 | 18:00 |
| D & E. Alternating constant airspeed climbs & descents: |       |       |
| 1. Climb 15M to 17M; level off                          | 02:00 | 20:00 |
| 2. Descent 17M to 15M; level off                        | 02:00 | 22:00 |
| 3. Climb 15M to 17M; level off                          | 02:00 | 24:00 |
| 4. Descent 17M to 15M; level off                        | 02:00 | 26:00 |
| 5. Climb 15M to 17M; level off                          | 02:00 | 28:00 |
| 6. Descent 17M to 15M; level off                        | 02:00 | 30:00 |

Restrictions: Direct the climbs and descents for 2000' altitude change. Allow two minutes for each. This allows for a level off and short term straight and level flight. Level flight at 17M takes about 82%; 13M about 80.5%. Complete the practice segment at 30:00 elapsed and prepare for evaluation.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

FREEZE TRAINER.

30:00

|   |       |      |     |      |       |  |
|---|-------|------|-----|------|-------|--|
| Evaluation  | 20:00 | 360° | 15M | 250K | 81.5% |  |
| <p><u>Objective:</u> The subject will perform and be evaluated on:</p> <ul style="list-style-type: none"> <li>A. Straight and level flight.</li> <li>B. Normal turn left to heading.</li> <li>C. Normal turn right to heading.</li> <li>D. Constant airspeed climbs.</li> <li>E. Constant airspeed descents.</li> </ul> <p>Refer to evaluation sheet.</p> |       |      |     |      |       |  |

# EVALUATION SHEET - INSTRUCTIONS - SORTIE 2/3

|   |         |
|---|---------|
| Reset clock to 00:00 elapsed  | Elapsed |
| Set:  |         |
| ADACS - Position 1. Stop  |         |
| Direct:   |         |
| "Perform straight and level flight heading 360°<br>at 15,000' and 250 knots." |         |
| START CLOCK   | 00:00   |
| START ADACS   |         |
| UNFREEZE - refer to Attachment 2 for grading                                  |         |
| Record characteristic performance: A  |         |
| ADACS - Stop Change to Position 2.  | 04:00   |
| Assume control and reset to initial conditions                                |         |
| Freeze Trainer  |         |
| Direct:   | 04:30   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 05:00   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>1</sub>                             |         |
| ADACS - Stop Remain on Position 2   | 06:30   |
| Assume control and reset to initial conditions.                               |         |
| Freeze Trainer  |         |
| Direct:   | 07:00   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 07:30   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>2</sub>                             |         |

|   |       |
|---|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions.<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."  | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)   |       |
| ADACS - Start   | 10:00 |
| Direct:<br>"Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                   |       |
| Record characteristic performance: C <sub>1</sub>   |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 11:30 |
| Direct:<br>"Fly straight and level."  | 12:00 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS-- Start   | 12:30 |
| Direct:<br>"Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."                      |       |
| Record characteristic performance: C <sub>2</sub>   |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 14:00 |
| Direct:<br>"Fly straight and level."  | 14:30 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 15:00 |
| Direct:<br>"Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."                      |       |
| Record characteristic performance: D  |       |

ADACS - Stop Change to Position 5 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to position 1. 20:00  
Assume control and reset to initial conditions  
Freeze Trainer

EGRESS Trainer

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       |
|--------|--------------------------------------|----------|----------|-------|
|        | Heading                              | Altitude | Airspeed | RPM   |
| I-4    | 360°                                 | 15M      | 250K     | 81.5% |

This sortie is a .50-minute criterion evaluation. The subject will be directed to perform all maneuvers during the first 20 minutes under normal conditions. During the remaining 30 minutes, the subject will again be directed to perform all maneuvers but with task loading factors included

Data will be collected from the ADACS (switches controlled by IP) and the IP.

CRITERION SORTIE INSTRUCTIONS - SORTIE 4

Part 1 - 20 Minutes - No Loading

|                             |   |         |
|-----------------------------|---|---------|
|                             |   | Elapsed |
| <u>Subject Activity:</u>    | 1. Adjust seat.<br>2. Put on headset.   |         |
| <u>Instructor Activity:</u> | 1. Adjust seat.<br>2. Put on headset - comm check<br>3. Check:<br>a. Door closed<br>b. Initial conditions set<br>c. ADACS - on Position 1. Stop<br>d. Rudder & aileron trim - neutral<br>e. Motion - on |         |

WHEN READY

Direct:

"Perform straight and level flight heading 360° at 15,000' and 250 knots."

START CLOCK

00:00

START ADACS

UNFREEZE - refer to Attachment 2 for grading

Record characteristic performance: A

ADACS - Stop Change to Position 2.

04:00

Assume control and reset to initial conditions

Freeze Trainer

Direct:

04:30

"Fly straight and level."

UNFREEZE (ST&L for approx 30 sec)

ADACS - Start

05:00

Direct:

"Turn left to 270° using 30° of bank.  
Maintain altitude and airspeed."

Record Characteristic performance: B<sub>1</sub>

ADACS - Stop Remain on Position 2

06:30

Assume Control and reset to initial conditions

Freeze trainer

|  |       |
|--|-------|
| Direct:  | 07:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 07:30 |
| Direct:  |       |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."  |       |
| Record characteristic performance: B <sub>2</sub>                          |       |
| ADACS - Stop Change to position 3.   | 09:00 |
| Assume control and reset to initial conditions.                            |       |
| Freeze trainer   |       |
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed." |       |
| Record characteristic performance: C <sub>1</sub>                          |       |
| ADACS - Stop Remain on Position 3.   | 11:30 |
| Assume control and reset to initial conditions                             |       |
| Freeze trainer   |       |
| Direct:  | 12:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)                                      |       |
| ADACS - Start  | 12:30 |
| Direct:  |       |
| "Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."    |       |
| Record characteristic performance: C <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 4.   | 14:00 |
| Assume control and reset to initial conditions.                            |       |
| Freeze trainer   |       |

Direct: 14:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 15:00

Direct:  
"Climb to 17,000' at a constant airspeed of 250K,  
Maintain heading."

Record characteristic performance: D

ADACS - Stop Change to position 5. 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to Position 1. 20:00  
Assume control and reset to initial conditions.  
Freeze trainer

Part 2 - 30 Minutes - Loading

Set Load Factor One ( $L_1$ ) CG to Max - 35%  
Reset clock to 00:00 elapsed

Direct:

"Perform straight and level flight heading 360° at  
15,000' and 250 knots."

START CLOCK  
START ADACS  
UNFREEZE

00:00

Record characteristic performance: A/ $L_1$

ADACS - Stop Change to Position 2.  
Assume control and reset to initial conditions  
Freeze trainer

04:00

Direct:

"Fly straight and level."

04:30

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start

05:00

Direct:

"Turn left to 270° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance: B/ $L_1$

ADACS - Stop Change to Position 3.  
Assume control and reset to initial conditions  
Freeze trainer

06:30

Direct:

"Fly straight and level."

07:00

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start

07:30

Direct:

"Turn right to 090° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance: C/ $L_1$

ADACS - Stop Change to Position 4.  
Assume control and reset to initial conditions  
Freeze trainer

09:00

|   |       |
|---|-------|
| Direct:   | 09:30 |
| "Fly straight and level."   |       |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 10:00 |
| Direct:   |       |
| "Climb to 17,000' at a constant airspeed of 250 knots.<br>Maintain heading."  |       |
| Record characteristic performance: D/L <sub>1</sub>   |       |
| ADACS - Stop Change to Position 5.<br>Assume control and reset to initial conditions<br>Freeze trainer  | 12:00 |
| Direct:   | 12:30 |
| "Fly straight and level."   |       |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 13:00 |
| Direct:   |       |
| "Descend to 13,000' at a constant airspeed of 250 knots.<br>Maintain heading."  |       |
| Record characteristic performance: E/L <sub>1</sub>   |       |
| ADACS - Stop Change to Position 1.<br>Assume control and reset to initial conditions<br>Freeze trainer and reset clock to 00:00<br>Set load factor one back to normal.<br>Set load factor two (L <sub>2</sub> ) rough air to max. | 15:00 |
| Reset clock to 00:00 elapsed  |       |
| Direct:   |       |
| "Perform straight and level flight heading 360° at<br>15,000' and 250 knots."   |       |
| START CLOCK<br>START ADACS<br>UNFREEZE  | 00:00 |
| Record characteristic performance: A/L <sub>2</sub>   |       |
| ADACS - Stop Change to Position 2.<br>Assume control and reset to initial conditions<br>Freeze trainer  | 04:00 |

|  |       |
|--|-------|
| Direct:  | 04:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 05:00 |
| Direct:  |       |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."    |       |
| Record characteristic performance: B/L <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 3.   | 06:30 |
| Assume control and reset to initial conditions                               |       |
| Freeze trainer   |       |
| Direct:  | 07:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 07:30 |
| Direct:  |       |
| "Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."   |       |
| Record characteristic performance: C/L <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 4.   | 09:00 |
| Assume control and reset to initial conditions                               |       |
| Freeze trainer   |       |
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Climb to 17,000' at a constant airspeed of 250 knots.<br>Maintain heading." |       |
| Record characteristic performance: D/L <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 5.   | 12:00 |
| Assume control and reset to initial conditions                               |       |
| Freeze trainer   |       |

Direct. 12:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 13:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250 knots.  
Maintain heading."

Record characteristic performance: E/L<sub>2</sub>

ADACS - Stop Change to Position 1. 15:00  
Assume control and reset to initial conditions  
Freeze trainer and reset clock to 00:00

Set load factor two back to zero.  
EGRESS TRAINER

# GROUP II

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |                 |                  |              | Timing<br>(Approx) |
|--------|--------------------------------------|-----------------|------------------|--------------|--------------------|
| II-1   | Heading<br>360°                      | Altitude<br>15M | Airspeed<br>250K | RPM<br>81.5% |                    |

Objective: The subject will receive error detection instruction on and practice maneuvers preceded by a skill test.

The subject will be given an evaluation on maneuvers A, B, C, at the end of the sortie.

Subject Activity:

1. Adjust seat
2. Put on headset

Instructor Activity:

1. Adjust seat
2. Put on headset - Comm check
3. Check
  - a. Door closed
  - b. Initial conditions set
  - c. ADACS - on position 1. Stop
  - d. Rudder and aileron trim - neutral
  - e. Motion - on

(02:00)

WHEN READY - START CLOCK - ADACS START - UNFREEZE

00:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Skill Test | 05:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Subject Activity: Perform straight and level flight for 05:00 starting from a frozen state of initial conditions.

Instructor Activity: Monitor only (no instruction) while subject flies straight and level. At the end of 05:00

elapsed:

ADACS - STOP

05:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|         |       |      |     |      |       |
|---------|-------|------|-----|------|-------|
| A. ST&L | 04:00 | 360° | 15M | 250K | 81.5% |
|---------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct straight and level flight.

Discuss:

- a. Bar width pitch control.
- b. Correction procedures for altitude deviation and instruments used.
- c. Bank control.
- d. Correction procedure for heading deviation and instruments used.
- e. Power control.
- f. Correction procedures for airspeed deviation and instruments used.
- g. Crosscheck pattern for straight and level flight.
- h. Trim.

Complete your instruction by 09:00 elapsed.

GO ON TO NEXT SEGMENT.

09:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                       |       |      |     |      |       |
|-----------------------|-------|------|-----|------|-------|
| B & C. 30° Bank Turns | 03:00 | 360° | 15M | 250K | 81.5% |
|-----------------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct 30° bank turns in both directions. Direct the roll in and roll out without regard for heading. Discuss:

- a. Centralized crosscheck for roll in; specifically, where to look.
- b. How to move the controls for roll in.
- c. What the attitude picture should be for a 30° bank turn.
- d. Extra back pressure required.
- e. Power control - approx 83% in the turn.
- f. Rhythmic crosscheck in steady state.
- g. How to correct for deviations.
- h. Centralized crosscheck for roll out.
- i. How to move the controls for roll out.
- j. Crosscheck when straight and level

Complete your instruction by 12:00 elapsed.

GO ON TO NEXT SEGMENT.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

12:00

|        |                              |       |      |     |      |       |
|--------|------------------------------|-------|------|-----|------|-------|
| B & C. | 30° bank turns<br>to heading | 03:00 | 360° | 15M | 250K | 81.5% |
|--------|------------------------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct 30° bank turns to a heading in both directions. Select a heading for the subject to turn to. Discuss:

- a. The use of the attitude indicator to determine a lead point (1/3 angle of bank).
- b. The emphasis on the heading indicator as it nears the lead point.
- c. The centralized crosscheck for roll out at the lead point.

Complete your instruction by 15:00 elapsed.

GO ON TO NEXT SEGMENT.

15:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                   |       |      |     |      |       |
|-------------------|-------|------|-----|------|-------|
| Practice A, B, C. | 20:00 | 360° | 15M | 250K | 81.5% |
|-------------------|-------|------|-----|------|-------|

Subject Activity: Practice maneuvers A, B, C, as directed by the IP while receiving minimal error detection feedback.

Instructor Activity: Direct the practice of maneuvers A, B, C. Do not make error analysis. Point out each significant deviation or error (excluding momentary deviations or minor false starts) and let the subject make his own

decision on corrective action. DO NOT re-teach any maneuver.

Timing Control: Divide the maneuvers into the following segments. At the elapsed time go on to the next maneuver.

**NOTE**

DO NOT START A SEGMENT  
BEFORE THE STATED TIME

|  |       |       |
|--|-------|-------|
| A. Straight and level flight for       | 06:00 | 21:00 |
| B. 30° bank turns left to heading for  | 07:00 | 28:00 |
| C. 30° bank turns right to heading for | 07:00 | 35:00 |

Turns of: 90° takes approx 1 minute

180° takes approx 1 minute 50 sec

360° takes approx 3 minutes 20 sec

Complete the practice segment at 35:00 elapsed and prepare for evaluation.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

FREEZE TRAINER.

35:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 15:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- A. Straight and level flight.
- B. Normal left turn to heading.
- C. Normal right turn to heading.

Refer to evaluation sheet

EVALUATION SHEET - INSTRUCTIONS - SORTIE 1

|  | Elapsed |
|--|---------|
| Reset clock to 00:00 elapsed   |         |
| Set:   |         |
| ADACS - Position 1. Stop   |         |
| Direct:  |         |
| "Perform straight and level flight heading 360° at 15,000' and 250 knots." |         |
| START CLOCK  | 00:00   |
| START ADACS  |         |
| UNFREEZE - Refer to Attachment 2 for grading.                              |         |
| Record characteristic performance: A                                       |         |
| ADACS - Stop Change to Position 2.   | 04:00   |
| Assume control and reset to initial conditions.                            |         |
| Freeze Trainer   |         |
| Direct:  | 04:30   |
| "Fly straight and level"   |         |
| UNFREEZE -(subject will fly ST&L for approximately 30 sec)                 |         |
| ADACS - Start  | 05:00   |
| Direct:  |         |
| "Turn left to 270° using 30° of bank.                                      |         |
| Maintain altitude and airspeed."   |         |
| Record Characteristic performance: B <sub>1</sub>                          |         |
| ADACS - Stop Remain on Position 2.   | 06:30   |
| Assume control and reset to initial conditions                             |         |
| Freeze Trainer   |         |
| Direct:  | 07:00   |
| "Fly straight and level."  |         |
| UNFREEZE (ST&L for approximately 30 sec)                                   |         |
| ADACS - Start  | 07:30   |
| Direct:  |         |
| "Turn left to 270° using 30° of bank.                                      |         |
| Maintain altitude and airspeed."   |         |
| Record characteristic performance: B <sub>2</sub>                          |         |

ADACS - Stop Change to Position 3. 09:00  
Assume control and reset to initial conditions  
Freeze Trainer

Direct: 09:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 sec)

ADACS - Start 10:00

Direct:  
"Turn Right to 090° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance:  $C_1$

ADACS - Stop Remain on Position 3. 11:30  
Assume control and reset to initial conditions  
Freeze Trainer

Direct: 12:00  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 sec)

ADACS - Start 12:30

Direct:  
"Turn right to 180° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance:  $C_2$

ADACS - Stop Change to Position 1. 15:00  
Assume control and reset to initial conditions  
Freeze Trainer

EGRESS

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       |
|--------|--------------------------------------|----------|----------|-------|
|        | Heading                              | Altitude | Airspeed | RPM   |
| II-2   | 360°                                 | 15M      | 250K     | 81.5% |

Objective: The subject will receive error detection instruction on maneuvers D, E, and practice maneuvers A, B, C, D, E. The subject will be given an evaluation on all maneuvers at the end of the sortie.

Subject Activity:

1. Adjust seat
2. Put on headset

Instructor Activity:

1. Adjust seat to normal position
2. Put on headset - Comm check
3. Check
  - a. Door closed.
  - b. Initial conditions set
  - c. ADACS - Stop
  - d. Rudder and aileron trim - neutral
  - e. Motion - on

(02:00)

WHEN READY - START CLOCK - UNFREEZE

00:00

|                   |       |      |     |      |       |
|-------------------|-------|------|-----|------|-------|
| Practice A, B, C. | 05:00 | 360° | 15M | 250K | 81.5% |
|-------------------|-------|------|-----|------|-------|

Subject Activity: Warm up with practice on maneuvers A, B, C, as directed by the IP.

Instructor Activity: Direct the practice of maneuvers A, B, C. DO NOT make error analysis. Point out each significant deviation or error (excluding momentary deviations or minor false starts) and let the subject make his own

decision on corrective action. DO NOT re-teach any maneuver.

Timing Control: Divide the maneuvers into the following segments. At the elapsed time go on to the next maneuver.

**NOTE**

DO NOT START A SEGMENT  
BEFORE THE STATED TIME

|                                       |       |       |
|---------------------------------------|-------|-------|
| A. Straight and level for             | 02:00 | 02:00 |
| B. 30° bank left turn to heading for  | 01:30 | 03:30 |
| C. 30° bank right turn to heading for | 01:30 | 05:00 |

Complete the practice segment at 05:00 elapsed.

GO ON TO NEXT MANEUVER

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|        |          |       |      |     |      |       |
|--------|----------|-------|------|-----|------|-------|
|        | Climbs   |       |      |     |      |       |
| D & E. | Descents | 10:00 | 360° | 15M | 250K | 81.5% |

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct constant airspeed climbs and descents. Discuss:

- Climb:
- Entering from stable conditions.
  - Throttles to max with back pressure to approximate pitch attitude (3° nose hi).
  - Crosschecking airspeed and attitude.
  - Crosscheck in a steady state climb.
  - Calculation of lead point (VVI approx 2500 fpm).
  - Locating lead point (altimeter).

- g. Crosscheck for level off (airspeed and attitude).
- h. Throttles to approximate RPM with forward pressure on yoke to level flight pitch attitude.
- i. Crosscheck when back in straight and level flight.

Descent:

- a. Entering from stable conditions.
- b. Throttles to idle with forward pressure to approximate pitch attitude (3° nose lo).
- c. Crosschecking airspeed and attitude.
- d. Crosscheck in steady state descent.
- e. Calculation of lead point (VVI approx 2500 fpm).
- f. Locating lead point (altimeter).
- g. Crosscheck for level off (airspeed and attitude).
- h. Throttles to approximate RPM with back pressure to level flight pitch attitude.
- i. Crosscheck when back in straight and level flight.

Timing Control and Restrictions: Direct the climbs and descents for 2000' altitude change. Allow two minutes for each. This allows time for level off and straight and level. Level flight at 17M takes 82%, 13M takes 80.5%. Alternate climbs and descents so that the trainer remains +2000' from

15M.

Complete your instruction by 15:00 elapsed.

GO ON TO NEXT SEGMENT.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

15:00

|              |       |      |     |      |       |
|--------------|-------|------|-----|------|-------|
| Practice A-E | 15:00 | 360° | 15M | 250K | 81.5% |
|--------------|-------|------|-----|------|-------|

Subject Activity: Practice maneuvers A through E as directed by the IP while receiving minimal error detection feedback.

Instructor Activity: Direct the practice of maneuvers A through E. DO NOT make error analysis. Point out each significant deviation or error (excluding momentary deviations or minor false starts) and let the subject make his own decisions on corrective action. DO NOT re-teach any maneuver.

Timing Control: Divide the maneuvers into the following segments. At the elapsed time go on to the next maneuver.

**NOTE**

DO NOT START A SEGMENT  
BEFORE THE STATED TIME

|                                   |       |       |
|-----------------------------------|-------|-------|
| A. Straight and level flight for  | 02:00 | 17:00 |
| B. Two 30° bank turns left        |       |       |
| 1. 360° to 270°; roll out to ST&L | 01:30 | 18:30 |
| 2. 270° to 180°; roll out to ST&L | 01:30 | 20:00 |
| C. Two 30° bank turns right       |       |       |
| 1. 180° to 270°; roll out to ST&L | 01:30 | 21:30 |

2. 270° to 360°; roll out to ST&L 01:30 23:00  
D & E. Alternating constant airspeed

Climbs & Descents:

1. Climb 15M to 17M; level off 02:00 25:00

2. Descend 17M to 15M; level off 02:00 27:00

3. Climb 15M to 19M; level off 03:00 30:00

(19M requires about 83% RPM)

Complete practice segment at 30:00 elapsed and prepare for evaluation.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

FREEZE TRAINER.

30:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 20:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- A. Straight and level flight.
- B. Normal turn left to a heading.
- C. Normal turn right to a heading.
- D. Constant airspeed climbs.
- E. Constant airspeed descent.

Refer to evaluation sheet.

# EVALUATION SHEET - INSTRUCTIONS - SORTIE 2/3

|   |         |
|---|---------|
| Reset clock to 00:00 elapsed  | Elapsed |
| Set:  |         |
| ADACS - Position 1. Stop  |         |
| Direct:   |         |
| "Perform straight and level flight heading 360°<br>at 15,000' and 250 knots." |         |
| START CLOCK   | 00:00   |
| START ADACS   |         |
| UNFREEZE - refer to Attachment 2 for grading                                  |         |
| Record characteristic performance: A  |         |
| ADACS - Stop Change to Position 2.  | 04:00   |
| Assume control and reset to initial conditions                                |         |
| Freeze Trainer  |         |
| Direct:   | 04:30   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 05:00   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>1</sub>                             |         |
| ADACS - Stop Remain on Position 2   | 06:30   |
| Assume control and reset to initial conditions.                               |         |
| Freeze Trainer  |         |
| Direct:   | 07:00   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 07:30   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>2</sub>                             |         |

|   |       |
|---|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions.<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."  | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)   |       |
| ADACS - Start   | 10:00 |
| Direct:<br>"Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                   |       |
| Record characteristic performance: C <sub>1</sub>   |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 11:30 |
| Direct:<br>"Fly straight and level."  | 12:00 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS-- Start   | 12:30 |
| Direct:<br>"Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."                      |       |
| Record characteristic performance: C <sub>2</sub>   |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 14:00 |
| Direct:<br>"Fly straight and level."  | 14:30 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 15:00 |
| Direct:<br>"Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."                      |       |
| Record characteristic performance: D  |       |

|  |       |
|--|-------|
| ADACS - Stop Change to Position 5<br>Assume control and reset to initial conditions<br>Freeze trainer  | 17:00 |
| Direct:<br>"Fly straight and level."   | 17:30 |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 18:00 |
| Direct:<br>"Descend to 13,000' at a constant airspeed of 250K.<br>Maintain heading."                   |       |
| Record characteristic performance: E   |       |
| ADACS - Stop Change to position 1.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 20:00 |
| EGRESS Trainer   |       |

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       | Timing<br>(Approx) |
|--------|--------------------------------------|----------|----------|-------|--------------------|
|        | Heading                              | Altitude | Airspeed | RPM   |                    |
| II-3   | 360°                                 | 15M      | 250K     | 81.5% |                    |

Objective: The subject will receive final error detection instruction on all maneuvers and practice all maneuvers. The subject will be given an evaluation on all maneuvers at the end of the sortie.

Subject Activity:

1. Adjust seat.
2. Put on headset

Instructor Activity:

1. Adjust seat to normal position
2. Put on headset - Comm check
3. Check
  - a. Door closed
  - b. Initial conditions - set
  - c. ADACS - Stop
  - d. Rudder and aileron trim - neutral
  - e. Motion - On

(02:00)

WHEN READY - START CLOCK - UNFREEZE

00:00

|               |       |      |     |      |       |
|---------------|-------|------|-----|------|-------|
| Maneuvers A-E | 05:00 | 360° | 15M | 250K | 81.5% |
|---------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: This is the last segment of instruction you will be giving to the subject. From straight and level:

1. Direct a left turn to 300°
2. Direct a right turn to 360°
3. Direct a climb to 17M with level off
4. Direct a descent to 15M with level off
5. Maintain straight and level until 05:00

Special Instructions: Pause after each maneuver only long enough to stabilize the parameters. Go on to the next maneuver as soon as stabilized. The purpose of this instructional segment is to give a final refresher to the subject. DO NOT make error analysis while the subject is flying.

Complete instruction at 05:00 elapsed.

GO ON TO NEXT SEGMENT

05:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|              |       |      |     |      |       |
|--------------|-------|------|-----|------|-------|
| Practice A-E | 25:00 | 360° | 15M | 250K | 81.5% |
|--------------|-------|------|-----|------|-------|

Subject Activity: Practice maneuvers A-E as directed by IP while receiving minimal error detection feedback.

Instructor Activity: Direct the practice of maneuvers A-E.

DO NOT make error analysis. Point out each significant deviation of error (excluding momentary deviations or minor false starts) and let the student make his own decisions on corrective action. DO NOT re-teach any maneuver.

Timing Control:

- A. Straight and level for 03:00
- B. Three 30° bank turns left:

Elapsed

08:00

|                                       |       |       |
|---------------------------------------|-------|-------|
| 1. 360° to 270°; roll out to ST&L     | 01:30 | 09:30 |
| 2. 270° to 180°; roll out to ST&L     | 01:30 | 11:00 |
| 3. 180° to 360°; roll out to ST&L     | 02:00 | 13:00 |
| C. Three 30° bank turns right:        |       |       |
| 1. 360° to 090°; roll out ST&L        | 01:30 | 14:30 |
| 2. 090° to 180°; roll out ST&L        | 01:30 | 16:00 |
| 3. 180° to 360°; roll out ST&L        | 02:00 | 18:00 |
| D & E. Alternating constant airspeed: |       |       |
| Climbs and descents:                  |       |       |
| 1. Climb 15M to 17M; level off        | 02:00 | 20:00 |
| 2. Descent 17M to 15M; level off      | 02:00 | 22:00 |
| 3. Climb 15M to 17M; level off        | 02:00 | 24:00 |
| 4. Descent 17M to 15M; level off      | 02:00 | 26:00 |
| 5. Climb 15M to 17M; level off        | 02:00 | 28:00 |
| 6. Descend 17M to 15M; level off      | 02:00 | 30:00 |

Restrictions: Direct the climbs and descents for 2000' altitude change. Allow two minutes for each. This allows for a level off and short term straight and level flight. Level flight at 17M takes about 82%; 13M about 80.5%. Complete the practice segment at 30:00 elapsed and prepare for evaluation.

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

FREEZE TRAINER.

30:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 20:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- A. Straight and level flight
- B. Normal turn left to heading
- C. Normal turn right to heading
- D. Constant airspeed climbs
- E. Constant airspeed descents

Refer to evaluation sheet.

# EVALUATION SHEET - INSTRUCTIONS - SORTIE 2/3

|   |         |
|---|---------|
| Reset clock to 00:00 elapsed  | Elapsed |
| Set:  |         |
| ADACS - Position 1. Stop  |         |
| Direct:   |         |
| "Perform straight and level flight heading 360°<br>at 15,000' and 250 knots." |         |
| START CLOCK   | 00:00   |
| START ADACS   |         |
| UNFREEZE - refer to Attachment 2 for grading                                  |         |
| Record characteristic performance: A  |         |
| ADACS - Stop Change to Position 2.  | 04:00   |
| Assume control and reset to initial conditions                                |         |
| Freeze Trainer  |         |
| Direct:   | 04:30   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 05:00   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>1</sub>                             |         |
| ADACS - Stop Remain on Position 2   | 06:30   |
| Assume control and reset to initial conditions.                               |         |
| Freeze Trainer  |         |
| Direct:   | 07:00   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 07:30   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>2</sub>                             |         |

|   |       |
|---|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions.<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."  | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)   |       |
| ADACS - Start   | 10:00 |
| Direct:<br>"Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                   |       |
| Record characteristic performanc: C <sub>1</sub>  |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 11:30 |
| Direct:<br>"Fly straight and level."  | 12:00 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS-- Start   | 12:30 |
| Direct:<br>"Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."                      |       |
| Record characteristic performance: C <sub>2</sub>   |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 14:00 |
| Direct:<br>"Fly straight and level."  | 14:30 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 15:00 |
| Direct:<br>"Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."                      |       |
| Record characteristic performance: D  |       |

ADACS - Stop Change to Position 5 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to position 1. 20:00  
Assume control and reset to initial conditions  
Freeze Trainer

EGRESS Trainer

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       |
|--------|--------------------------------------|----------|----------|-------|
|        | Heading                              | Altitude | Airspeed | RPM   |
| II-4   | 360°                                 | 15M      | 250K     | 81.5% |

This sortie is a 50-minute criterion evaluation. The subject will be directed to perform all maneuvers during the first 20 minutes under normal conditions. During the remaining 30 minutes, the subject will again be directed to perform all maneuvers but with task loading factors included.

Data will be collected from the ADACS (switches controlled by IP) and the IP.

CRITERION SORTIE INSTRUCTIONS - SORTIE 4

Part 1 - 20 Minutes - No Loading

|                             |                                    | Elapsed |
|-----------------------------|------------------------------------|---------|
| <u>Subject Activity:</u>    | 1. Adjust seat.                    |         |
|                             | 2. Put on headset.                 |         |
| <u>Instructor Activity:</u> | 1. Adjust seat.                    |         |
|                             | 2. Put on headset - comm check     |         |
|                             | 3. Check:                          |         |
|                             | a. Door closed                     |         |
|                             | b. Initial conditions set          |         |
|                             | c. ADACS - on Position 1. Stop     |         |
|                             | d. Rudder & aileron trim - neutral |         |
|                             | e. Motion - on                     |         |

WHEN READY

Direct:

"Perform straight and level flight heading 360° at 15,000' and 250 knots."

START CLOCK

00:00

START ADACS

UNFREEZE - refer to Attachment 2 for grading

Record characteristic performance: A

ADACS - Stop Change to Position 2.

04:00

Assume control and reset to initial conditions

Freeze Trainer

Direct:

04:30

"Fly straight and level."

UNFREEZE (ST&L for approx 30 sec)

ADACS - Start

05:00

Direct:

"Turn left to 270° using 30° of bank.  
Maintain altitude and airspeed."

Record Characteristic performance: B<sub>1</sub>

ADACS - Stop Remain on Position 2

06:30

Assume Control and reset to initial conditions

Freeze trainer

|  |       |
|--|-------|
| Direct:  | 07:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 07:30 |
| Direct:  |       |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."  |       |
| Record characteristic performance: B <sub>2</sub>                          |       |
| ADACS - Stop Change to position 3.   | 09:00 |
| Assume control and reset to initial conditions.                            |       |
| Freeze trainer   |       |
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed." |       |
| Record characteristic performance: C <sub>1</sub>                          |       |
| ADACS - Stop Remain on Position 3.   | 11:30 |
| Assume control and reset to initial conditions                             |       |
| Freeze trainer   |       |
| Direct:  | 12:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)                                      |       |
| ADACS - Start  | 12:30 |
| Direct:  |       |
| "Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."    |       |
| Record characteristic performance: C <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 4.   | 14:00 |
| Assume control and reset to initial conditions.                            |       |
| Freeze trainer   |       |

|   |       |
|---|-------|
| Direct:   | 14:30 |
| "Fly straight and level."   |       |
| UNFREEZE (ST&L for approx 30 seconds)                                     |       |
| ADACS - Start   | 15:00 |
| Direct:   |       |
| "Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."   |       |
| Record characteristic performance: D                                      |       |
| ADACS - Stop Change to position 5.  | 17:00 |
| Assume control and reset to initial conditions                            |       |
| Freeze trainer  |       |
| Direct:   | 17:30 |
| "Fly straight and level."   |       |
| UNFREEZE (ST&L for approx 30 seconds)                                     |       |
| ADACS - Start   | 18:00 |
| Direct:   |       |
| "Descend to 13,000' at a constant airspeed of 250K.<br>Maintain heading." |       |
| Record characteristic performance: E                                      |       |
| ADACS - Stop Change to Position 1.  | 20:00 |
| Assume control and reset to initial conditions.                           |       |
| Freeze trainer  |       |

Part 2 - 30 Minutes - Loading

Set Load Factor One ( $L_1$ ) CG to Max - 35%  
Reset clock to 00:00 elapsed

Direct:

"Perform straight and level flight heading 360° at  
15,000' and 250 knots."

START CLOCK  
START ADACS  
UNFREEZE

00:00

Record characteristic performance: A/ $L_1$

ADACS - Stop Change to Position 2.  
Assume control and reset to initial conditions  
Freeze trainer

04:00

Direct:

"Fly straight and level."

04:30

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start

05:00

Direct:

"Turn left to 270° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance: B/ $L_1$

ADACS - Stop Change to Position 3.  
Assume control and reset to initial conditions  
Freeze trainer

06:30

Direct:

"Fly straight and level."

07:00

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start

07:30

Direct:

"Turn right to 090° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance: C/ $L_1$

ADACS - Stop Change to Position 4.  
Assume control and reset to initial conditions  
Freeze trainer

09:00

|  |       |
|--|-------|
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Climb to 17,000' at a constant airspeed of 250 knots.<br>Maintain heading."   |       |
| Record characteristic performance: D/L <sub>1</sub>                            |       |
| ADACS - Stop Change to Position 5.   | 12:00 |
| Assume control and reset to initial conditions                                 |       |
| Freeze trainer   |       |
| Direct:  | 12:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 13:00 |
| Direct:  |       |
| "Descend to 13,000' at a constant airspeed of 250 knots.<br>Maintain heading." |       |
| Record characteristic performance: E/L <sub>1</sub>                            |       |
| ADACS - Stop Change to Position 1.   | 15:00 |
| Assume control and reset to initial conditions                                 |       |
| Freeze trainer and reset clock to 00:00  |       |
| Set load factor one back to normal.  |       |
| Set load factor two (L <sub>2</sub> ) rough air to max.                        |       |
| Reset clock to 00:00 elapsed   |       |
| Direct:  |       |
| "Perform straight and level flight heading 360° at<br>15,000' and 250 knots."  |       |
| START CLOCK  | 00:00 |
| START ADACS  |       |
| UNFREEZE   |       |
| Record characteristic performance: A/L <sub>2</sub>                            |       |
| ADACS - Stop Change to Position 2.   | 04:00 |
| Assume control and reset to initial conditions                                 |       |
| Freeze trainer   |       |

|  |       |
|--|-------|
| Direct:  | 04:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 05:00 |
| Direct:  |       |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."    |       |
| Record characteristic performance: B/L <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 3.   | 06:30 |
| Assume control and reset to initial conditions                               |       |
| Freeze trainer   |       |
| Direct:  | 07:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 07:30 |
| Direct:  |       |
| "Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."   |       |
| Record characteristic performance: C/L <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 4.   | 09:00 |
| Assume control and reset to initial conditions                               |       |
| Freeze trainer   |       |
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Climb to 17,000' at a constant airspeed of 250 knots.<br>Maintain heading." |       |
| Record characteristic performance: D/L <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 5.   | 12:00 |
| Assume control and reset to initial conditions                               |       |
| Freeze trainer   |       |

Direct: 12:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 13:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250 knots.  
Maintain heading."

Record characteristic performance: E/L<sub>2</sub>

ADACS - Stop Change to Position 1. 15:00  
Assume control and reset to initial conditions  
Freeze trainer and reset clock to 00:00

Set load factor two back to zero.  
EGRESS TRAINER

# GROUP III

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       | Timing<br>(Approx) |
|--------|--------------------------------------|----------|----------|-------|--------------------|
| III-1  | Heading                              | Altitude | Airspeed | RPM   |                    |
|        | 360°                                 | 15M      | 250K     | 81.5% |                    |

Objective: The subject will receive procedural instruction on and practice maneuvers preceded by a skill test. The subject will be given an evaluation on maneuvers A, B, C, at the end of the sortie.

Subject Activity:

1. Adjust seat
2. Put on headset

Instructor Activity:

1. Adjust seat to normal position
2. Put on headset - Comm check
3. Check
  - a. Door closed
  - b. Initial conditions set
  - c. ADACS - on position 1. - Stop
  - d. Rudder and aileron trim - neutral
  - e. Motion - on

(02:00)

## NOTE

THE IP WILL BE ENTERING AND EXITING THE TRAINER NUMEROUS TIMES DURING EACH SORTIE. BE SURE THE TRAINER DOOR IS FULLY CLOSED AFTER EACH ENTRY/EXIT.

WHEN READY - START CLOCK - ADACS START - UNFREEZE

00:00

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Skill Test | 05:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Subject Activity: Perform straight and level flight for 05:00 starting from a frozen state of initial conditions.

Instructor Activity: Monitor only (no instruction) while subject flies straight and level. At the end of 05:00 elapsed:

ADACS - STOP

05:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|         |       |      |     |      |       |
|---------|-------|------|-----|------|-------|
| A. ST&L | 04:00 | 360° | 15M | 250K | 81.5% |
|---------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct straight and level flight. Cover each discussion item one time only. DO NOT answer questions. Discuss:

- a. Bar width pitch control.
- b. Correction procedures for altitude deviation and instruments used.
- c. Bank control.
- d. Correction procedure for heading deviation and instruments used.
- e. Power control.
- f. Correction procedures for air-speed deviation and instruments used.
- g. Crosscheck pattern for straight and level flight.
- h. Trim.

Complete your procedural instruction by 09:00 elapsed.

GO ON TO NEXT SEGMENT

09:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                       |       |      |     |      |       |
|-----------------------|-------|------|-----|------|-------|
| B & C. 30° Bank Turns | 03:00 | 260° | 15M | 250K | 81.5% |
|-----------------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct 30° bank turns in both directions. Direct the roll in and roll out without regard for heading. Cover each discussion item one time only.

DO NOT answer questions. Discuss:

- a. Centralized crosscheck for roll in; specifically, where to look.
- b. How to move the control for roll in.
- c. What the attitude picture should be for a 30° bank turn.
- d. Extra back pressure required.
- e. Power control - approx 83% in the turn.
- f. Rhythmic crosscheck in steady state.
- g. How to correct for deviations.
- h. Centralized crosscheck for roll out.
- i. How to move the controls for

roll out.

j. Crosscheck when straight and level.

Complete your procedural instruction by 12:00 elapsed.

GO ON TO NEXT SEGMENT.

12:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS.

|                                     |       |      |     |      |       |
|-------------------------------------|-------|------|-----|------|-------|
| 30° Bank turns<br>B & C. to heading | 03:00 | 360° | 15M | 250K | 81.5% |
|-------------------------------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct 30° bank turns to a heading in both directions. Select a heading for the subject to turn to. Cover each discussion item one time only. DO NOT answer questions. Discuss:

- The use of the attitude indicator to determine a lead point (1/3 angle of bank).
- The emphasis on the heading indicator as it nears the lead point.
- The centralized crosscheck for roll out at the lead point.

Complete your instruction by 15:00 elapsed.

GO ON TO NEXT SEGMENT

15:00

ASSUME CONTROL & RESET TRAINER & FREEZE.

|                   |       |      |     |      |  |
|-------------------|-------|------|-----|------|--|
| Practice A, B, C. | 20:00 | 360° | 15M | 250K |  |
|-------------------|-------|------|-----|------|--|

Instructor Activity: EXIT TRAINER - CHECK DOOR CLOSED.

When outside, direct the subject to practice straight and level flight until further advised. State the desired parameters for heading, altitude, and airspeed. UNFREEZE from outside. Subject will practice A for 06:00.

Direct subject to practice left 30° bank turns selecting his own roll out headings until further advised.

21:00

Subject will practice B for 07:00.

Direct subject to practice right 30° bank turns selecting his own headings until further advised.

28:00

Subject will practice C for 07:00

FREEZE TRAINER FROM OUTSIDE

35:00

ENTER AND PREPARE FOR EVALUATION

RESET TRAINER TO INITIAL CONDITIONS

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 15:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- A. Straight and level flight.
- B. Normal left turn to a heading.
- C. Normal right turn to a heading.

Refer to evaluation sheet.

EVALUATION SHEET - INSTRUCTIONS - SORTIE 1

|  | Elapsed |
|--|---------|
| Reset clock to 00:00 elapsed   |         |
| Set:   |         |
| ADACS - Position 1. Stop   |         |
| Direct:  |         |
| "Perform straight and level flight heading 360° at 15,000' and 250 knots." |         |
| START CLOCK  | 00:00   |
| START ADACS  |         |
| UNFREEZE - Refer to Attachment 2 for grading.                              |         |
| Record characteristic performance: A                                       |         |
| ADACS - Stop Change to Position 2.   | 04:00   |
| Assume control and reset to initial conditions.                            |         |
| Freeze Trainer   |         |
| Direct:  | 04:30   |
| "Fly straight and level"   |         |
| UNFREEZE -(subject will fly ST&L for approximately 30 sec)                 |         |
| ADACS - Start  | 05:00   |
| Direct:  |         |
| "Turn left to 270° using 30° of bank.                                      |         |
| Maintain altitude and airspeed."   |         |
| Record Characteristic performance: B <sub>1</sub>                          |         |
| ADACS - Stop Remain on Position 2.   | 06:30   |
| Assume control and reset to initial conditions                             |         |
| Freeze Trainer   |         |
| Direct:  | 07:00   |
| "Fly straight and level."  |         |
| UNFREEZE (ST&L for approximately 30 sec)                                   |         |
| ADACS - Start  | 07:30   |
| Direct:  |         |
| "Turn left to 270° using 30° of bank.                                      |         |
| Maintain altitude and airspeed."   |         |
| Record characteristic performance: B <sub>2</sub>                          |         |

|  |       |
|--|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."   | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 10:00 |
| Direct:<br>"Turn Right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                  |       |
| Record characteristic performance: C <sub>1</sub>  |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 11:30 |
| Direct:<br>"Fly straight and level."   | 12:00 |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 12:30 |
| Direct:<br>"Turn right to 180° using 30° of bank.<br>Maintain altitude and airspeed."                  |       |
| Record characteristic performance: C <sub>2</sub>  |       |
| ADACS - Stop Change to Position 1.<br>Assume control and reset to initial conditions<br>Freeze Trainer | 15:00 |
| EGRESS   |       |

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |                 |                  |              | Timing<br>(Approx) |
|--------|--------------------------------------|-----------------|------------------|--------------|--------------------|
| III-2  | Heading<br>360°                      | Altitude<br>15M | Airspeed<br>250K | RPM<br>81.5% |                    |

Objective: The subject will receive procedural instruction on maneuvers D, E. and practice maneuvers A, B, C, D, E. The subject will be given an evaluation on all maneuvers at the end of the sortie.

Subject Activity:

1. Adjust seat.
2. Put on headset

Instructor Activity: Check

- a. Initial conditions set.
- b. ADACS - Stop.
- c. Rudder and aileron trim - neutral.
- d. Motion - On.
- e. Clock - reset to zero elapsed.

EXIT TRAINER - CHECK DOOR CLOSED

(02:00)

|                   |       |      |     |      |  |
|-------------------|-------|------|-----|------|--|
| Practice A, B, C. | 05:00 | 360° | 15M | 250K |  |
|-------------------|-------|------|-----|------|--|

Instructor Activity: From outside.

When ready, direct subject to practice straight and level flight until further advised. State the desired parameters for heading, altitude, and airspeed.

START TIMING - UNFREEZE FROM OUTSIDE

00:00

Subject will practice A for 02:00.

Direct subject to perform a left 30° bank turn to 270°.

Allow 01:30.

02:00

Direct subject to perform a right 30° bank turn to 360°.

03:30

FREEZE TRAINER FROM OUTSIDE

05:00

ENTER TRAINER

ASSUME CONTROL & RESET TO INITIAL CONDITIONS AS REQUIRED.

| Climbs |          |       |      |     |      |       |
|--------|----------|-------|------|-----|------|-------|
| D & E. | Descents | 10:00 | 360° | 15M | 250K | 81.5% |

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: Instruct Constant airspeed climbs and descents. Cover each discussion item one time only. DO NOT answer questions. Discuss:

- Climb:
- Entering from stable conditions.
  - Throttles to max with back pressure to approximate pitch attitude (3° nose hi).
  - Crosschecking airspeed and attitude.
  - Crosscheck in a steady state climb.
  - Calculation of lead point (VVI approx 2500 fpm).
  - Locating lead point (altimeter).
  - Crosscheck for level off (air-speed and attitude).
  - Throttles to approximate RPM with forward pressure on yoke to level

flight pitch attitude.

i. Crosscheck when back in straight and level flight.

Descent:

a. Entering from stable conditions.

b. Throttles to idle with forward pressure to approximate pitch attitude ( $3^{\circ}$  nose lo).

c. Crosschecking airspeed and attitude.

d. Crosscheck in steady state descent.

e. Calculation of lead point (VVI approx 2100 fpm).

f. Locating lead point (altimeter).

g. Crosscheck for level off (air-speed and attitude).

h. Throttles to approximate RPM with back pressure to level flight pitch attitude.

i. Crosscheck when back in straight and level flight.

Restrictions: Direct the climbs and descents for 2000' altitude change. Allow two minutes for each. This allows time for level off and straight and level. Level flight at 17M takes 82%, 13M takes 80.5%.

Timing Control: Alternate climbs and descents so that the trainer remains  $\pm 2000'$  from 15M.

Complete your instruction by 15:00 elapsed.

GO ON TO NEXT SEGMENT.

15:00

ASSUME CONTROL & RESET TRAINER & FREEZE.

|               |       |      |     |      |  |
|---------------|-------|------|-----|------|--|
| Practice A-E. | 15:00 | 360° | 15M | 250K |  |
|---------------|-------|------|-----|------|--|

Instructor Activity: EXIT TRAINER - CHECK DOOR CLOSED.

When outside, direct the subject to practice straight and level flight until further advised. State the desired parameters for heading, altitude, and airspeed. UNFREEZE from outside. Subject will practice A for 02:00.

Direct subject to practice 30° bank turns in both directions selecting his own rollout headings until further advised. Subject will practice B & C for 06:00.

17:00

Direct subject to practice constant airspeed climbs and descents making sure to alternate every other one. Make altitude changes of 2000'.

23:00

Subject will practice D & E for 07:00

FREEZE TRAINER FROM OUTSIDE.

30:00

ENTER AND PREPARE FOR EVALUATION.

RESET TRAINER TO INITIAL CONDITIONS.

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 20:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- A. Straight and level flight.
- B. Normal turn left to a heading.
- C. Normal turn right to a heading.

D. Constant airspeed climbs.

E. Constant airspeed descent.

Refer to evaluation sheet.

EVALUATION SHEET - INSTRUCTIONS - SORTIE 2/3

|   |         |
|---|---------|
| Reset clock to 00:00 elapsed  | Elapsed |
| Set:  |         |
| ADACS - Position 1. Stop  |         |
| Direct:   |         |
| "Perform straight and level flight heading 360°<br>at 15,000' and 250 knots." |         |
| START CLOCK   | 00:00   |
| START ADACS   |         |
| UNFREEZE - refer to Attachment 2 for grading                                  |         |
| Record characteristic performance: A  |         |
| ADACS - Stop Change to Position 2.  | 04:00   |
| Assume control and reset to initial conditions                                |         |
| Freeze Trainer  |         |
| Direct:   | 04:30   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 05:00   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>1</sub>                             |         |
| ADACS - Stop Remain on Position 2   | 06:30   |
| Assume control and reset to initial conditions.                               |         |
| Freeze Trainer  |         |
| Direct:   | 07:00   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 07:30   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>2</sub>                             |         |

|   |       |
|---|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions.<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."  | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)   |       |
| ADACS - Start   | 10:00 |
| Direct:<br>"Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                   |       |
| Record characteristic performance: C <sub>1</sub>   |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 11:30 |
| Direct:<br>"Fly straight and level."  | 12:00 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS-- Start   | 12:30 |
| Direct:<br>"Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."                      |       |
| Record characteristic performance: C <sub>2</sub>   |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 14:00 |
| Direct:<br>"Fly straight and level."  | 14:30 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 15:00 |
| Direct:<br>"Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."                      |       |
| Record characteristic performance: D  |       |

ADACS - Stop Change to Position 5 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to position 1. 20:00  
Assume control and reset to initial conditions  
Freeze Trainer

EGRESS Trainer

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |                 |                  |              | Timing<br>(Approx) |
|--------|--------------------------------------|-----------------|------------------|--------------|--------------------|
| III-3  | Heading<br>360°                      | Altitude<br>15M | Airspeed<br>250K | RPM<br>81.5% |                    |

Objective: The subject will receive final procedural instruction on all maneuvers and practice all maneuvers. The subject will be given an evaluation on all maneuvers at the end of the sortie.

Subject Activity:

1. Adjust seat
2. Put on headset

Instructor Activity:

1. Adjust seat to normal position
2. Put on headset - Comm check
3. Check
  - a. Door closed
  - b. Initial conditions - set
  - c. ADACS - off
  - d. Rudder & aileron trim - neutral
  - e. Motion - On

(02:00)

WHEN READY - START CLOCK - UNFREEZE

00:00

|               |       |      |     |      |       |
|---------------|-------|------|-----|------|-------|
| Maneuvers A-E | 05:00 | 360° | 15M | 250K | 81.5% |
|---------------|-------|------|-----|------|-------|

Subject Activity: Maintain control of the trainer while receiving instruction.

Instructor Activity: This is the last segment of instruction you will be giving to the subject. From straight and level:

1. Direct a left turn to 300°.
2. Direct a right turn to 360°.
3. Direct a climb to 17M with level off.
4. Direct a descent to 15M with level off.
5. Maintain straight and level until 05:00.

Special Instructions: Pause after each maneuver only long enough to stabilize the parameters. Go on to the next maneuver as soon as stabilized. The purpose of this instructional segment is to give a final refresher to the subject. DO NOT make error analysis while subject is flying. Only cover procedural steps.

Complete procedural instruction at 05:00 elapsed.

GO ON TO NEXT SEGMENT.

05:00

ASSUME CONTROL & RESET TO INITIAL CONDITIONS & FREEZE.

|              |       |      |     |      |  |
|--------------|-------|------|-----|------|--|
| Practice A-E | 25:00 | 360° | 15M | 250K |  |
|--------------|-------|------|-----|------|--|

Instructor Activity: EXIT TRAINER - CHECK DOOR CLOSED.

When outside, direct the subject to practice straight and level flight until further advised. State the desired parameters for heading, altitude, and airspeed.

UNFREEZE FROM OUTSIDE.

Subject will practice A for 03:00.

Direct subject to practice 30° bank turns in both directions selecting his own rollout headings until further advised.

08:00

Subject will practice B & C for 10:00.

Direct subject to practice constant airspeed climbs and descents alternating every other one. Make altitude changes of 2000'.

18:00

Subject will practice D & E for 12:00.

FREEZE TRAINER FROM OUTSIDE

30:00

ENTER AND PREPARE FOR EVALUATION

RESET TRAINER TO INITIAL CONDITIONS.

|            |       |      |     |      |       |
|------------|-------|------|-----|------|-------|
| Evaluation | 20:00 | 360° | 15M | 250K | 81.5% |
|------------|-------|------|-----|------|-------|

Objective: The subject will perform and be evaluated on:

- A. Straight and level flight.
- B. Normal turn left to a heading.
- C. Normal turn right to a heading.
- D. Constant airspeed climbs.
- E. Constant airspeed descents.

Refer to evaluation sheet.

# EVALUATION SHEET - INSTRUCTIONS - SORTIE 2/3

|   |         |
|---|---------|
| Reset clock to 00:00 elapsed  | Elapsed |
| Set:  |         |
| ADACS - Position 1. Stop  |         |
| Direct:   |         |
| "Perform straight and level flight heading 360°<br>at 15,000' and 250 knots." |         |
| START CLOCK   | 00:00   |
| START ADACS   |         |
| UNFREEZE - refer to Attachment 2 for grading                                  |         |
| Record characteristic performance: A  |         |
| ADACS - Stop Change to Position 2.  | 04:00   |
| Assume control and reset to initial conditions                                |         |
| Freeze Trainer  |         |
| Direct:   | 04:30   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 05:00   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>1</sub>                             |         |
| ADACS - Stop Remain on Position 2   | 06:30   |
| Assume control and reset to initial conditions.                               |         |
| Freeze Trainer  |         |
| Direct:   | 07:00   |
| "Fly straight and level."   |         |
| UNFREEZE (ST&L for approx 30 sec)   |         |
| ADACS - Start   | 07:30   |
| Direct:   |         |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."     |         |
| Record characteristic performance: B <sub>2</sub>                             |         |

|   |       |
|---|-------|
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions.<br>Freeze Trainer | 09:00 |
| Direct:<br>"Fly straight and level."  | 09:30 |
| UNFREEZE (ST&L for approx 30 sec)   |       |
| ADACS - Start   | 10:00 |
| Direct:<br>"Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                   |       |
| Record characteristic performance: C <sub>1</sub>   |       |
| ADACS - Stop Remain on Position 3.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 11:30 |
| Direct:<br>"Fly straight and level."  | 12:00 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS-- Start   | 12:30 |
| Direct:<br>"Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."                      |       |
| Record characteristic performance: C <sub>2</sub>   |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions.<br>Freeze trainer | 14:00 |
| Direct:<br>"Fly straight and level."  | 14:30 |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 15:00 |
| Direct:<br>"Climb to 17,000' at a constant airspeed of 250K,<br>Maintain heading."                      |       |
| Record characteristic performance: D  |       |

ADACS - Stop Change to Position 5 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to position 1. 20:00  
Assume control and reset to initial conditions  
Freeze Trainer

EGRESS Trainer

| Sortie | INITIAL CONDITIONS ON TRAINER FREEZE |          |          |       |
|--------|--------------------------------------|----------|----------|-------|
|        | Heading                              | Altitude | Airspeed | RPM   |
| III-4  | 360°                                 | 15M      | 250K     | 81.5% |

This sortie is a 50-minute criterion evaluation. The subject will be directed to perform all maneuvers during the first 20 minutes under normal conditions. During the remaining 30 minutes, the subject will again be directed to perform all maneuvers but with task loading factors included.

Data will be collected from the ADACS (switches controlled by IP) and the IP.

CRITERION SORTIE INSTRUCTIONS - SORTIE 4

Part 1 - 20 Minutes - No Loading

|                                    | Elapsed |
|------------------------------------|---------|
| <u>Subject Activity:</u>           |         |
| 1. Adjust seat.                    |         |
| 2. Put on headset.                 |         |
| <u>Instructor Activity:</u>        |         |
| 1. Adjust seat.                    |         |
| 2. Put on headset - comm check     |         |
| 3. Check:                          |         |
| a. Door closed                     |         |
| b. Initial conditions set          |         |
| c. ADACS - on Position 1. Stop     |         |
| d. Rudder & aileron trim - neutral |         |
| e. Motion - on                     |         |

WHEN READY

Direct:

"Perform straight and level flight heading 360° at 15,000' and 250 knots."

START CLOCK

00:00

START ADACS

UNFREEZE - refer to Attachment 2 for grading

Record characteristic performance: A

ADACS - Stop Change to Position 2.

04:00

Assume control and reset to initial conditions

Freeze Trainer

Direct:

04:30

"Fly straight and level."

UNFREEZE (ST&L for approx 30 sec)

ADACS - Start

05:00

Direct:

"Turn left to 270° using 30° of bank.  
Maintain altitude and airspeed."

Record Characteristic performance: B<sub>1</sub>

ADACS - Stop Remain on Position 2

06:30

Assume Control and reset to initial conditions

Freeze trainer

|  |       |
|--|-------|
| Direct:  | 07:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 07:30 |
| Direct:  |       |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."  |       |
| Record characteristic performance: B <sub>2</sub>                          |       |
| ADACS - Stop Change to position 3.   | 09:00 |
| Assume control and reset to initial conditions.                            |       |
| Freeze trainer   |       |
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 sec)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed." |       |
| Record characteristic performance: C <sub>1</sub>                          |       |
| ADACS - Stop Remain on Position 3.   | 11:30 |
| Assume control and reset to initial conditions                             |       |
| Freeze trainer   |       |
| Direct:  | 12:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)                                      |       |
| ADACS - Start  | 12:30 |
| Direct:  |       |
| "Turn right to 090° using 30° bank.<br>Maintain altitude and airspeed."    |       |
| Record characteristic performance: C <sub>2</sub>                          |       |
| ADACS - Stop Change to Position 4.   | 14:00 |
| Assume control and reset to initial conditons.                             |       |
| Freeze trainer   |       |

Direct: 14:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 15:00

Direct:  
"Climb to 17,000' at a constant airspeed of 250K,  
Maintain heading."

Record characteristic performance: D

ADACS - Stop Change to position 5. 17:00  
Assume control and reset to initial conditions  
Freeze trainer

Direct: 17:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 18:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250K.  
Maintain heading."

Record characteristic performance: E

ADACS - Stop Change to Position 1. 20:00  
Assume control and reset to initial conditions.  
Freeze trainer

AD-A035 682

AIR FORCE HUMAN RESOURCES LAB BROOKS AFB TEX  
INVESTIGATION OF DIAGNOSTIC, ERROR DETECTOR, AND SELF-TAUGHT IN--ETC(U)  
OCT 76 D M TYLER, R W MCFADDEN, E E EDDOWES  
AFHRL-TR-76-65

F/G 5/9

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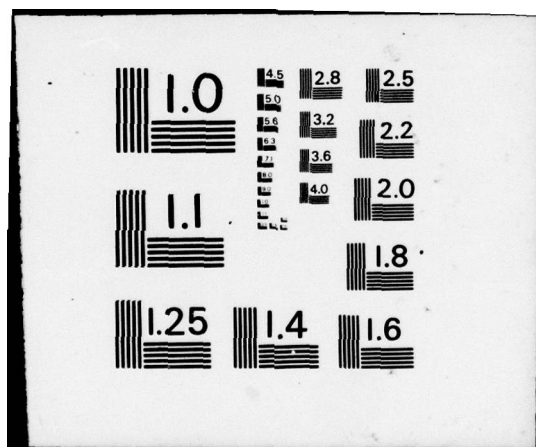
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3 of 3  
ADA035682

DATE  
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END

DATE  
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3 - 77



Part 2 - 30 Minutes - Loading

Set Load Factor One ( $L_1$ ) CG to Max - 35%  
Reset clock to 00:00 elapsed

Direct:

"Perform straight and level flight heading 360° at  
15,000' and 250 knots."

START CLOCK  
START ADACS  
UNFREEZE

00:00

Record characteristic performance: A/ $L_1$

ADACS - Stop Change to Position 2.  
Assume control and reset to initial conditions  
Freeze trainer

04:00

Direct:

"Fly straight and level."

04:30

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start

05:00

Direct:

"Turn left to 270° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance: B/ $L_1$

ADACS - Stop Change to Position 3.  
Assume control and reset to initial conditions  
Freeze trainer

06:30

Direct:

"Fly straight and level."

07:00

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start

07:30

Direct:

"Turn right to 090° using 30° of bank.  
Maintain altitude and airspeed."

Record characteristic performance: C/ $L_1$

ADACS - Stop Change to Position 4.  
Assume control and reset to initial conditions  
Freeze trainer

09:00

|   |       |
|---|-------|
| Direct:   | 09:30 |
| "Fly straight and level."   |       |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 10:00 |
| Direct:   |       |
| "Climb to 17,000' at a constant airspeed of 250 knots.<br>Maintain heading."  |       |
| Record characteristic performance: D/L <sub>1</sub>   |       |
| ADACS - Stop Change to Position 5.<br>Assume control and reset to initial conditions<br>Freeze trainer  | 12:00 |
| Direct:   | 12:30 |
| "Fly straight and level."   |       |
| UNFREEZE (ST&L for approx 30 seconds)   |       |
| ADACS - Start   | 13:00 |
| Direct:   |       |
| "Descend to 13,000' at a constant airspeed of 250 knots.<br>Maintain heading."  |       |
| Record characteristic performance: E/L <sub>1</sub>   |       |
| ADACS - Stop Change to Position 1.<br>Assume control and reset to initial conditions<br>Freeze trainer and reset clock to 00:00<br>Set load factor one back to normal.<br>Set load factor two (L <sub>2</sub> ) rough air to max. | 15:00 |
| Reset clock to 00:00 elapsed  |       |
| Direct:   |       |
| "Perform straight and level flight heading 360° at<br>15,000' and 250 knots."   |       |
| START CLOCK<br>START ADACS<br>UNFREEZE  | 00:00 |
| Record characteristic performance: A/L <sub>2</sub>   |       |
| ADACS - Stop Change to Position 2.<br>Assume control and reset to initial conditions<br>Freeze trainer  | 04:00 |

|  |       |
|--|-------|
| Direct:  | 04:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 05:00 |
| Direct:  |       |
| "Turn left to 270° using 30° of bank.<br>Maintain altitude and airspeed."                              |       |
| Record characteristic performance: B/L <sub>2</sub>  |       |
| ADACS - Stop Change to Position 3.<br>Assume control and reset to initial conditions<br>Freeze trainer | 06:30 |
| Direct:  | 07:00 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 07:30 |
| Direct:  |       |
| "Turn right to 090° using 30° of bank.<br>Maintain altitude and airspeed."                             |       |
| Record characteristic performance: C/L <sub>2</sub>  |       |
| ADACS - Stop Change to Position 4.<br>Assume control and reset to initial conditions<br>Freeze trainer | 09:00 |
| Direct:  | 09:30 |
| "Fly straight and level."  |       |
| UNFREEZE (ST&L for approx 30 seconds)  |       |
| ADACS - Start  | 10:00 |
| Direct:  |       |
| "Climb to 17,000' at a constant airspeed of 250 knots.<br>Maintain heading."                           |       |
| Record characteristic performance: D/L <sub>2</sub>  |       |
| ADACS - Stop Change to Position 5.<br>Assume control and reset to initial conditions<br>Freeze trainer | 12:00 |

Direct: 12:30  
"Fly straight and level."

UNFREEZE (ST&L for approx 30 seconds)

ADACS - Start 13:00

Direct:  
"Descend to 13,000' at a constant airspeed of 250 knots.  
Maintain heading."

Record characteristic performance: E/L<sub>2</sub>

ADACS - Stop Change to Position 1. 15:00  
Assume control and reset to initial conditions  
Freeze trainer and reset clock to 00:00

Set load factor two back to zero.  
EGRESS TRAINER

# SORTIE SYNOPSIS

| I<br>DIAGNOSTIC |                             | II<br>ERROR DETECTION       |                             | III<br>SELF-TAUGHT          |        |
|-----------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--------|
| SORTIE 1        | 30 MIN PREFLT BRP - OUTSIDE | 30 MIN PREFLT BRP - OUTSIDE | 30 MIN PREFLT BRP - OUTSIDE | 30 MIN PREFLT BRP - OUTSIDE |        |
|                 | 5 MIN SKILL TEST (ST&L)     | 5 MIN SKILL TEST (ST&L)     | 5 MIN SKILL TEST (ST&L)     | 5 MIN SKILL TEST (ST&L)     | IP IN  |
|                 | 10 MIN INSTR (A-C)          | 10 MIN INSTR (A-C)          | 10 MIN INSTR (A-C)          | 10 MIN INSTR (A-C)          | IP IN  |
|                 | 20 MIN PRAC (A-C)           | 20 MIN PRAC (A-C)           | 20 MIN PRAC (A-C)           | 20 MIN PRAC (A-C)           | IP OUT |
|                 | 15 MIN EVAL (A-C)           | 15 MIN EVAL (A-C)           | 15 MIN EVAL (A-C)           | 15 MIN EVAL (A-C)           | IP IN  |
| SORTIE 2        | 5 MIN PRAC (A-C)            | 5 MIN PRAC (A-C)            | 5 MIN PRAC (A-C)            | 5 MIN PRAC (A-C)            | IP OUT |
|                 | 10 MIN INSTR (D, E)         | 10 MIN INSTR (D, E)         | 10 MIN INSTR (D, E)         | 10 MIN INSTR (D, E)         | IP IN  |
|                 | 15 MIN PRAC (A-E)           | 15 MIN PRAC (A-E)           | 15 MIN PRAC (A-E)           | 15 MIN PRAC (A-E)           | IP OUT |
|                 | 20 MIN EVAL (A-E)           | 20 MIN EVAL (A-E)           | 20 MIN EVAL (A-E)           | 20 MIN EVAL (A-E)           | IP IN  |
| SORTIE 3        | 5 MIN INSTR (A-E)           | 5 MIN INSTR (A-E)           | 5 MIN INSTR (A-E)           | 5 MIN INSTR (A-E)           | IP IN  |
|                 | 25 MIN PRAC (A-E)           | 25 MIN PRAC (A-E)           | 25 MIN PRAC (A-E)           | 25 MIN PRAC (A-E)           | IP OUT |
|                 | 20 MIN EVAL (A-E)           | 20 MIN EVAL (A-E)           | 20 MIN EVAL (A-E)           | 20 MIN EVAL (A-E)           | IP IN  |
| SORTIE 4        |                             | 50 MIN CRITERION RIDE (A-E) | 50 MIN CRITERION RIDE (A-E) | 50 MIN CRITERION RIDE (A-E) |        |

Attachment 1

# SUBJECTIVE PERFORMANCE CRITERIA

| CROSSCHECK |   | DEVIATIONS   | CORRECTIONS  | A/C CONTROL  |
|------------|---|--|--|--|
| U          | Unable to accomplish or any crosscheck deteriorates no discernible pattern. | Large prolonged and unnoticed.                                       | Nonexistent or excessive and ineffective.  | Loses control to the point wherein A/C IP would assume control. Behind A/C       |
| F-         | Incomplete, characterized by fixations on one instrument.                   | Large, prolonged but eventually noticed.                             | Generally too large and too late when applied.                                   | Erratic to the tolerance limits but doesn't lose control. Slightly behind A/C.   |
| F+         | Occasionally incomplete. Some discernible pattern.                          | Large and often but not prolonged. Minor deviations still unnoticed. | Generally too large when applied but not too late. Commits false starts often.   | Erratic but well within tolerance limits. Just barely with the A/C.              |
| G-         | Complete but slow. A discernible pattern developed.                         | Generally timely notice of <u>all</u> deviations.                    | Generally are timely but not precise. Commits infrequent and minor false starts. | Within tolerance limits enough to be positive, generally smooth. Right with A/C. |
| G          | Complete and effective.   | All deviations noticed in a timely manner.                           | Corrections timely and effective to return A/C to target values.                 | Smooth and positive. Ahead of A/C.   |
| G+         | Complete and effective. Adjustable to situation.                            | All deviations are small.  | Quick, effective and return A/C to target values.                                | Smooth and very positive. Well ahead of A/C.                                     |
| E          | Timely, orderly, adaptable, rapid, effective.                               | All deviations are small and infrequent.                             | Smooth, precise and not often needed.  | Excellent control most of the time.  |

Attachment 2

*APPENDIX F:* INSTRUCTOR PILOT EVALUATION FORMS

Student Name \_\_\_\_\_

Date \_\_\_\_\_

IP Name \_\_\_\_\_

EVALUATION SHEET - DATA - SORTIE 1A. Straight & Level Flight:

Start 00:00

End 04:00

|          | U     | F-    | F+    | G-    | G     | G+    | E     |
|----------|-------|-------|-------|-------|-------|-------|-------|
| Heading  | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Altitude | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

B<sub>1</sub>. Left Normal Turn to 270°:

Start 05:00

End 06:30

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

B<sub>2</sub>. Left Normal Turn to 270°:

Start 07:30

End 09:00

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

C<sub>1</sub>. Right Normal Turn to 090°:

Start 10:00

End 11:30

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

C<sub>2</sub>. Right Normal Turn to 090°:

Start 12:30

End 15:00

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

Student Name \_\_\_\_\_

Date \_\_\_\_\_

IP Name \_\_\_\_\_

EVALUATION SHEET - DATA - SORTIE 2/3  
(Circle appropriate #)

A. Straight & Level Flight

Start 00:00

End 04:00

U      F-      F+      G-      G      G+      E

Heading \_\_\_\_\_

Altitude \_\_\_\_\_

Airspeed \_\_\_\_\_

B<sub>1</sub>. Left Normal Turn to 270°:

Start 05:00

End 06:30

U      F-      F+      G-      G      G+      E

Altitude \_\_\_\_\_

Airspeed \_\_\_\_\_

Bank Control \_\_\_\_\_

Roll Out Accuracy \_\_\_\_\_

B<sub>2</sub>. Left Normal Turn to 270°:

Start 07:30

End 09:00

U      F-      F+      G-      G      G+      E

Altitude \_\_\_\_\_

Airspeed \_\_\_\_\_

Bank Control \_\_\_\_\_

Roll Out Accuracy \_\_\_\_\_

C<sub>1</sub>. Right Normal Turn to 090°:

Start 10:00

End 11:30

U      F-      F+      G-      G      G+      E

Altitude \_\_\_\_\_

Airspeed \_\_\_\_\_

Bank Control \_\_\_\_\_

Roll Out Accuracy \_\_\_\_\_

C<sub>2</sub>. Right Normal Turn to 090°:

Start 12:30

End 14:00

U      F-      F+      G-      G      G+      E

Altitude \_\_\_\_\_

Airspeed \_\_\_\_\_

Bank Control \_\_\_\_\_

Roll Out Accuracy \_\_\_\_\_

D. CAS Climb to 17,000':

Start 15:00

End 17:00

|  | U | F- | F+ | G- | G | G+ | E |
|--|---|----|----|----|---|----|---|
|--|---|----|----|----|---|----|---|

|                   |       |       |       |       |       |       |       |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Heading           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Leveloff Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

E. CAS Descent to 13,000':

Start 18:00

End 20:00

|  | U | F- | F+ | G- | G | G+ | E |
|--|---|----|----|----|---|----|---|
|--|---|----|----|----|---|----|---|

|                   |       |       |       |       |       |       |       |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Heading           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Leveloff Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

Student Name \_\_\_\_\_

Date \_\_\_\_\_

IP Name \_\_\_\_\_

EVALUATION SHEET - DATA - SORTIE 4A. Straight & Level Flight: Start 00:00 End 04:00

|          | U     | F-    | F+    | G-    | G     | G+    | E     |
|----------|-------|-------|-------|-------|-------|-------|-------|
| Heading  | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Altitude | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

B<sub>1</sub> Left Normal Turn to 270°: Start 05:00 End 06:30

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

B<sub>2</sub> Left Normal Turn to 270°: Start 07:30 End 09:00

|                   | U     | F-    | F+    | G-    | G     | F+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

C<sub>1</sub> Right Normal Turn to 090°: Start 10:00 End 11:30

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

C<sub>2</sub> Right Normal Turn to 090°: Start 12:30 End 14:00

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

D. CAS Climb to 17,000':                      Start 15:00                      End 17:00

|                    |       |       |       |       |       |       |       |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
|                    | U     | F-    | F+    | G-    | G     | G+    | E     |
| Heading            | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Level Off Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

E. CAS Descent to 13,000':                      Start 18:00                      End 20:00

|                    |       |       |       |       |       |       |       |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
|                    | U     | F-    | F+    | G-    | G     | G+    | E     |
| Heading            | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Level Off Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

LOAD FACTOR ONE

A/L<sub>1</sub>. Straight & Level Flight:                      Start 00:00                      End 04:00

|          |       |       |       |       |       |       |       |
|----------|-------|-------|-------|-------|-------|-------|-------|
|          | U     | F-    | F+    | G-    | G     | G+    | E     |
| Heading  | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Altitude | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

B/L<sub>1</sub>. Left Normal Turn to 270°:                      Start 05:00                      End 06:30

|                   |       |       |       |       |       |       |       |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

C/L<sub>1</sub>. Right Normal Turn to 090°:                      Start 07:30                      End 09:00

|                   |       |       |       |       |       |       |       |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

D/L<sub>1</sub>. CAS Climb to 17,000': Start 10:00 End 12:00

|                    | U     | F-    | F+    | G-    | G     | G+    | E     |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Heading            | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Level Off Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

E/L<sub>1</sub>. CAS Descent to 13,000': Start 13:00 End 15:00

|                    | U     | F-    | F+    | G-    | G     | G+    | E     |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Heading            | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Level Off Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

### LOAD FACTOR TWO

A/L<sub>2</sub>. Straight & Level Flight: Start 00:00 End 04:00

|          | U     | F-    | F+    | G-    | G     | G+    | E     |
|----------|-------|-------|-------|-------|-------|-------|-------|
| Heading  | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Altitude | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

B/L<sub>2</sub>. Left Normal Turn to 270°: Start 05:00 End 06:30

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

C/L<sub>2</sub>. Right Normal Turn to 090°: Start 07:30 End 09:00

|                   | U     | F-    | F+    | G-    | G     | G+    | E     |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Altitude          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed          | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Bank Control      | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Roll Out Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

D/L<sub>2</sub>. CAS Climb to 17,000': Start 10:00 End 12:00

|                    | U     | F-    | F+    | G-    | G     | G+    | E     |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Heading            | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Level Off Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

E/L<sub>2</sub>. CAS Descent to 13,000':

Start 13:00

End 15:00

|  | U | F- | F+ | G- | G | G+ | E |
|--|---|----|----|----|---|----|---|
|--|---|----|----|----|---|----|---|

|                    |       |       |       |       |       |       |       |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Heading            | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Airspeed           | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Level Off Accuracy | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

*APPENDIX G: SUBJECT CRITIQUE OF INSTRUCTIONAL STRATEGIES*

T-40 INSTRUCTIONAL STRATEGIES  
CRITIQUE

Please answer all critique items and feel free to comment on any item in the space provided. Make your recommendations constructive if you react negatively to an item. Signature is optional.

Circle your responses using this scale:

| Definitely<br>Yes | Yes | Undecided | No | Definitely<br>No |
|-------------------|-----|-----------|----|------------------|
|-------------------|-----|-----------|----|------------------|

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

1. Did the pretraining materials help you prepare for the T-40 sorties?

A. Pretraining Guide

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

B. Pretraining Video Tape

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

2. Did you find flying the T-40 easier than you expected? (Except for the end of the last sortie.)

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

3A. Do you think your IP's method of teaching was effective enough for you to learn the maneuvers?

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

B. What would you liked to have seen in your IP's teaching method that wasn't there?

4. Did you feel at times that you would have learned more or understood better if you could have asked questions during the sorties?

1                      2                      3                      4                      5

5. Students \_\_\_\_\_ only.

Did it bother you that your IP only pointed out your errors without telling you why they occurred or how to make a correction?

1                      2                      3                      4                      5

6. Students \_\_\_\_\_ only.

Did it bother you that your IP left the trainer when you practiced, preventing you from asking questions about flying the maneuvers?

1                      2                      3                      4                      5

7. How do you feel you performed in the T-40?

|                                |                           |                          |                          |                               |
|--------------------------------|---------------------------|--------------------------|--------------------------|-------------------------------|
| Much better<br>than I expected | Better than<br>I expected | About like<br>I expected | Worse than<br>I expected | Much worse<br>than I expected |
| 1                              | 2                         | 3                        | 4                        | 5                             |

8. Do you feel you have an understanding of the five maneuvers so you could perform them in a different trainer?

|                   |     |           |    |                  |
|-------------------|-----|-----------|----|------------------|
| Definitely<br>Yes | Yes | Undecided | No | Definitely<br>No |
| 1                 | 2   | 3         | 4  | 5                |